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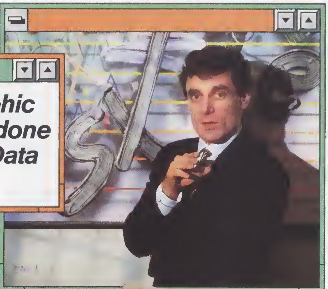

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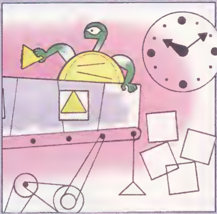

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STAFF LETTER

Why You Should Care About 1-2-3/G

Unlike most personal-computer publications, *LOTUS* magazine takes a pragmatic view of the torrent of new hardware and software released almost hourly. Instead of gushing superlatives about new technology for technology's sake, we view the new releases from a real-world perspective.

This month's cover story reflects the approach readers have come to expect from *LOTUS*. In "Inside *1-2-3/G*," Contributing Editor Daniel Gasteiger describes his experience in making the transition from *1-2-3*'s familiar MS-DOS, character-based interface to *1-2-3/G*'s Macintosh-like, mouse-and-icon work style.

As a pioneer in the use of *1-2-3*, and one of the founding editors of *LOTUS*, he is superbly equipped to be your guide to the new environment. Gasteiger has been programming computers since 1973 and has been using *1-2-3* since early 1984. He joined Lotus Development Corp. soon after graduating from Cornell University and later joined Lotus Publishing. During his four years at the magazine, he created the magazine's Macros columns and the technical-editing department, which ensures the accuracy of the technical material published in these pages.

MARK ALCAREZ

Contributing Editor Daniel Gasteiger

Daniel has a much more down-to-earth view of *1-2-3/G* than the reviewers you may have read elsewhere. The conventional wisdom after the introduction of *1-2-3/G* was that it would drive millions of users to buy OS/2, much as *1-2-3* fueled the demand for the IBM PC. "If *1-2-3/G* doesn't make OS/2 a best-seller, nothing will" was one common refrain. Here is Daniel's perception: "The only reason to go to OS/2 and *1-2-3/G* is for multitasking and superior networking capabilities."

However, Daniel's essay is relevant to spreadsheet users whether or not they plan to upgrade to OS/2 and *1-2-3/G*. His chronicle of the changes in thinking, action, and output resulting from the new technology gives a preview of the future. While he is not a mouse fan, Daniel finds that the graphical user interface offers important advantages even to keyboard addicts. "I started using the mouse reluctantly—having my fingers leave the keyboard is disorienting to me," he says. "But if you dare to use the mouse once or twice, you'll get around faster. It proves to be so much more efficient, not so much because of the mouse itself but because of the user interface." Daniel and Associate Editor Phyllis Sharon, who edited the article, add that the combination of pull-down menus, dialog boxes, and other components of the graphical interface represent a tremendous boon for people who use *1-2-3*.

So turn to page 28 for a glimpse of the type of interface that will most likely be in your future. If you doubt it, maybe the article will change your mind.

Larry Marion
Editor-in-Chief

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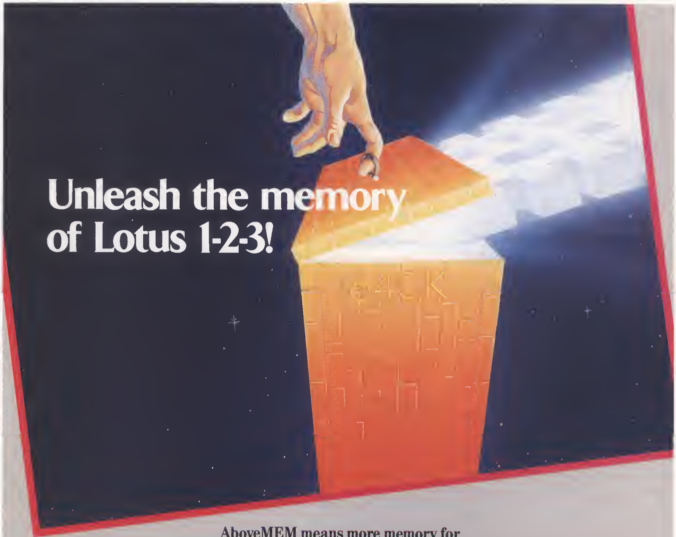

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LETTERS

EXPENSE-RECORDER MODEL FOR SYMPHONY

The *1-2-3* model presented in "An Income and Expense Recorder" [May, page 52] sounds too good to be true. I am a *Symphony* Release 2.0 user and am not proficient enough in *1-2-3* to translate the instructions into *Symphony*. Can someone help me?

Gerald Levine
Development Consultants
Boynton Beach, Fla

Editor's note: The *Symphony* version of this model varies greatly from the *1-2-3* version. We didn't have room to publish both, but we did create a *Symphony* version on disk for those readers who are interested. Please send a check for $20, payable to Lotus Publishing Corp., Box 9123, Cambridge, MA 02139-9123, if you want a disk copy. Specify whether you need a 5¼-inch or 3½-inch disk.

UNDOCUMENTED FEATURES OF WORDPERFECT 5.1

The review of *WordPerfect* 5.1 in "Beyond Text Editing" [April, page 92] contains two inaccuracies. The review states that up to 26 macros can be invoked by hitting the Alt key and a letter key. This is true, but it's misleading. By remapping the keyboard, you can attach any macro to any key combination. Thus, macros can be attached to Control-\, Alt-Home, and Control-F12.

The review also states that in *WordPerfect*, you cannot jump to a specific page during Print Preview. But the Goto command works in Print Preview, as well as in regular editing.

Greg Erwin
Aylmer, Quebec

The author replies: Mr. Erwin is correct on both counts. An unlimited number of macros is available. The manual does not mention this. It is also true that all of the cursor-movement commands work in Print Preview. The Goto command does not appear in the Print Preview menu, and it is not mentioned in the manual.

DIVIDENDS PLUS GETTING OUT IN TIME

The model in "When To Get In, When To Get Out" [October, page 32] doesn't handle dividends correctly. Instead of subtracting the dividend from the price, I suggest multiplying the price by a variance, the predividend price divided by the difference between the price and the dividend.

Sylvia Staudinger
Moser Software
Vienna, Austria

The author replies: Your method is valid and, in fact, more accurate in longer analyses. I opted for a simpler method. In short-term analyses, subtracting the dividend from the price also gives accurate results.

REVISITING LOAN STATUS

"The Loan-Status Analyzer" [November, page 56] requires some modifications. I could not reconcile an actual amortization schedule from my bank with the published worksheet. Two extra cells should be added to the input area: one for the loan's annual interest rate (named *int_yr*) and the other for the number of decimal places to which the monthly interest rate is rounded (named *round*). The cell named *int_yr* should be assigned the Percent format with two decimal places. The cell named *round* should be assigned the General format and should contain the value 9. The cell named *interest* should contain the formula @ROUND(int_yr/12,round). The @ROUND function should be added to

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You can also address *LOTUS* magazine in the LDC Spreadsheets Forum on the CompuServe Information Service. See Electronic Retrieval, below.

SUBMISSIONS

Models. To share a model with *LOTUS* readers, send it to the Models Editor. Explain what problem the model solves, how the model differs from other solutions, and what lessons it teaches. Include your credentials and a floppy disk.

Articles. If you wish to write tutorials, product reviews, case studies, or other material for *LOTUS*, write or send E-mail to Larry Marion, Editor-in-Chief. Include your credentials and samples of your work.

Letters. We welcome letters for publication. Please send them to Eleanor McCarthy, Managing Editor, and include a daytime telephone number. If your letter concerns one of our macro-oriented columns, send it via E-mail or fax it to Nicholas Delonas, Macros Editor. Letters may be edited for length and clarity.

Q&A and Good Ideas. Send submissions to Carrie Thomas, Technical Editor.

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Full text of *LOTUS* magazine since September 1987 is available on Computer Library, a CD-RDM product of Ziff Communications Co. Full text of *LOTUS* magazine since January 1988 is available on Lotus CD/Prompt, a CO-ROM product of Lotus Development Corp. (for information, call 1-800-223-1662, extension 3381). Full text of most *LOTUS* articles since 1987 can be found in Computer ASAP on Dialog Information Services and in Computer Database Plus on CompuServe.

Models published in *LOTUS* since 1988 are available in the *LOTUS* library, part of the LDC Spreadsheets Forum (GD LOTUSMAG) on CompuServe. For more information about *LOTUS* on-line, call CompuServe, 1-800-848-8199, and ask for representative 146, if outside the U.S. and Canada, call 1-614-457-0802. For information on how to download *LOTUS* models from CompuServe, see page 80 of the January 1990 issue. The models are also on Lotus CD/Prompt.

Abstracts of selected *LOTUS* articles can be found in Microcomputer Index (Learned Information Inc.) and in Business Software Database (Information Sources Inc.).

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ABOUT THIS MAGAZINE

LOTUS is published monthly by Lotus Publishing Corp., a subsidiary of Lotus Development Corp., and is intended to help users of Lotus spreadsheet software. The editorial content of *LOTUS* is not determined by Lotus Development Corp., and the software reviews and other opinions expressed in *LOTUS* do not necessarily represent the views of the parent corporation.

the formulas in the *Interest Expense* column so that the results are rounded to two decimal places.

Bruce Miller
Baltimore, Md.

Editor's note: The modifications are valid. However, the purpose of this model is not to second-guess a lending institution but to evaluate the effects of extra payments on a loan. In addition, businesses can compute values for their outstanding loans, interest expense, and cash accounts. Even without the rounding you propose, the worksheet's results are useful for testing and comparing extra-payment scenarios.

OFFICE SPACE CONUNDRUM

"Office Space: Buy or Lease?" [April, page 54] contains some errors that could be misleading.

When money is not used for downpayment, it goes elsewhere—into a bank account or into company operating funds. Whether the money is used for downpayment or invested, taxes are owed at the marginal rate. The model does not show the impact of taxes.

The model attributes yearly operating costs to ownership, not to leasing. Occasionally the tenant pays some increase in operating costs above a base amount, depending on the type of lease. The model ignores inflation in operating costs.

Here's how I would improve Ken Landis's model. First, enter the label *Annual growth rate* in cell A16, and enter *5%* in cell E16. Assign cell E16 the Percent format with two decimal places. Enter the label *Annual operating expenses* in cell A20, and enter *4000* in cell E20. This cell represents the maintenance expense you incur by leasing the property. Now change the cost-of-leasing formula in cell I7 to (E18+E20)*E5 to take this maintenance expense into account. Finally, change the estimated-appreciation formula in cell I16 to (E9*(1+E16)^E5)–E9. The original formula returns $75,000, but this new formula returns $69,070. It adjusts total appreciation to the time frame.

The model also does not recognize that much of the benefit of ownership comes from appreciation, before income taxes and selling costs are due. This model is no substitute for professional advice.

Andrew Cassel
Heritage Equity Funding Corp.
Toronto, Ont.

The author replies: The model doesn't assume that the buyer is cashing in equity. It demonstrates only the buildup of equity. Under the ongoing concern assumption, the business would either occupy these quarters for a long time (for the lifetime of the business) or sell them with the business, at which time the owner would realize a blended gain based on the value of all the property and equipment. Also, adding real estate taxes, yearly insurance premiums, and maintenance costs to the operating expenses can indeed make the model easier to use and more accurate for some businesses. However, users should be sure to adjust their marginal tax rate for the inclusion of real estate taxes. You don't want to double count.

I agree that the model is not a substitute for professional advice. It was meant to be thought provoking.

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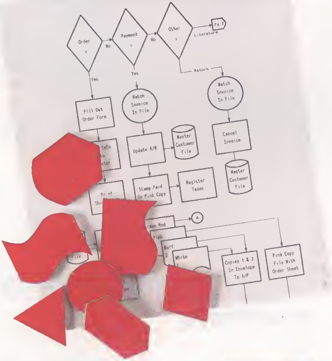

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Intelligent Documents Arrive

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Frustrated by a training manual that is too big to be useful? Instead, consider one that contains only the pages an employee needs and that can be made funny, serious, sarcastic, or philosophical, depending on the employee's particular mood that day.

Looking for a new way to make employees toe the line on expenses? Use an electronic expense account report that automatically notifies the chief financial officer when the junior executive overdoes it with the caviar and martinis and spends more than the allotted $100 for lunch with a client.

Interleaf, the Cambridge, Mass.–based electronic-publishing company, is promising that these applications, and dozens more, will soon be possible because of a new software technology called active documents. The firm, which makes software for creating sophisticated documents and which includes many Fortune 500 companies among its customers, has been billing the new technology as a "major breakthrough."

Active documents, it says, will have the "intelligence to access information, evaluate it, and act on it." No one, including Interleaf, is saying that the company has actually invented truly intelligent software with the ability to think and make decisions.

Those who are familiar with prototypes of active-document technology, however, say it is not a gimmicky come-on but an important new step in electronic publishing. These documents, even if they aren't intelligent, have a wonderful capacity to act as if they are because of the way they can be programmed. In effect, they know their own contents. They can also be programmed to know who is looking at them.

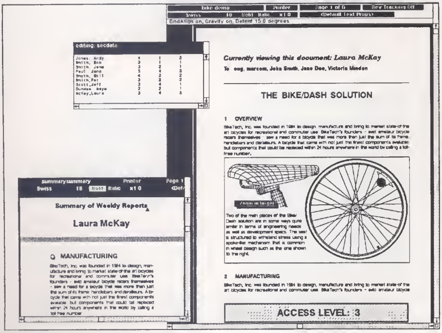
"What Interleaf is doing is pretty farsighted," says Esther Dyson, the editor and publisher of *Release 1.0*, a PC-industry newsletter. "I hate to use the word *unique*, but call it unprecedented."

Other analysts and consultants are more cautious. "It's not as if there were no other smart documents," says Jeffrey Tarter, editor of *Softletter*, a software-industry newsletter, "but Interleaf has taken the concept further than anyone else."

Interleaf officially introduced its active-document technology in March at the Seybold Seminars '90 in Boston. It whet the appetite of just about everyone who follows the electronic-publishing field. But its true importance won't be known until the software hits the marketplace in the fourth quarter. It is expected to run on all computers Interleaf supports, including Apple, Apollo, Digital Equipment, Hewlett-Packard, IBM (RISC System/6000 and 386-based personal computers), and Sun Microsystems.

"I think it's a dynamite product," says Peter Schleider, a partner and analyst at the investment banking firm of Wessels, Arnold & Henderson in Minneapolis.

Embedded in active documents are specially written programs. The more sophisticated the programming, the more active documents can do. Once an active document has been set up, it can be modified and reconfigured by a user without any programming skill. But to build an active document from scratch requires professional programming knowledge. Interleaf will be sending some cus-



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Smith, Bob	3	1	1
Smith, Jane	3	2	1
Paul, Jane	5	4	3
Smyth, Bill	4	2	2
Smith, Pat	3	3	2
Scott, Jeff	3	4	1
Dundee, Maye	2	2	1
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THE BIKE/DASH SOLUTION

1 OVERVIEW

2 MANUFACTURING

ACCESS LEVEL: 3

Summary of Weekly Reports

Laura McKay

MANUFACTURING

An active document can access information from other documents and evaluate their contents for further action.

MICHELE NOISET

tomers a toolkit specifically geared for companies that want to build active documents either with their professional programming staff or with the help of an outside developer.

Depending on how you program it, says Interleaf, active-document technology can be used to help an office worker prepare a lengthy, perfectly formatted, and error-free document for the federal government. It can be used to create an urgent memo that, in conjunction with voice-annotation software, announces its presence when it is electronically mailed. The document can automatically mail itself to the right people. It can be used to create a proposal that makes information inaccessible to those who don't have the proper security clearance. It can send a message to each person on a sales force. Once the answer comes back, it can then automatically send out an upbeat reply if sales are up or a warning if they are down.

Active-document technology also works closely with *1-2-3*. Data from a spreadsheet can be used to generate an Interleaf chart. If the information in the spreadsheet is changed, the chart in the document is automatically updated. Information from the spreadsheet can also be used, for example, to generate an illustration in which, for example, the pieces of a bicycle are sized to reflect their manufacturing costs.

Amoco Corp.'s Houston site has been testing an alpha version of Interleaf's software customized by Amoco. The technology will help engineers through the unwieldy process of preparing construction-bid packages for equipment ranging from offshore oil platforms to entire gas plants. In the past, when a technical question came up—for instance, about an industry standard for a certain design specification—there wasn't always a person on staff with enough expertise to answer it. Usually, the engineer preparing the package had to wade through volumes of material to find the answer. In many cases, company engineers were "exceeding [standards] by so much it was costing us a fortune," says David Scheulen, a staff analyst for Amoco who helped coordinate the company's new document process.

But with an active document, an engineer no longer has to rely on the expertise of others, trudge to the corporate library, or interpret standard values without assistance. An Amoco engineer will be able to get virtually all the information he needs without leaving his PC.

The way the system has been programmed, the document automatically flags the engineer if he or she types in a value that is outside the accepted range for a given design specification. If he wants to find out what the choices are for a design specification, he can click on a button within the document and a list of acceptable choices pops up. If he has a question about a value or wants to know what the industry standard is, he simply clicks on another button and the computer searches through a CD-ROM for pertinent information.

With the capability of calling up the standards on screen, engineers will be able to write bid packages that comply with all industry standards instead of unnecessarily exceeding them. The net result, says Scheulen, is that Amoco expects to save millions of dollars a year in construction costs.

Capabilities such as these are the reason some consultants are so bullish about Interleaf's new product. Amy D. Wohl, an office-automation consultant retained by Interleaf to evaluate active documents,

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says the technology fulfills a need to individually tailor and customize information. Instead of getting a letter that is filled with extraneous information, she envisions active documents automatically creating one that has only the information absolutely necessary to the person reading it. She is also intrigued by the notion of using active documents in the classroom to create an individualized electronic textbook for each student. "Such books can be dynamically customized based upon a student's records, his or her answers to a questionnaire, or how the student answered test questions as he or she proceeded through the book," says Wohl, whose company is based in Bala Cynwyd, Pa.

"It's a pretty sexy product," says Wohl. "I get to see a lot of stuff, and I don't get excited too often."

Gerald Michalski, director of the Intelligent Document Management Research Service, a Mountain View, Calif., firm that provides research services for clients on advanced information technology, wasn't quite as ecstatic because active documents aren't yet on the market. But he is definitely intrigued. The ability to publish a good-looking document isn't enough anymore, says Michalski. "You have to add some rules, some ability to do reasoning."

If active documents can actually do all the wonderful things that Interleaf promises, he will be delighted. Says Michalski: "This is the kind of stuff we're looking for." *—H. G. Bissinger*

MICHELE NOISET

WINDOWS 3.0 MUDDLES THE GUI UPGRADE PATH

Will the real operating environment please stand up?

Microsoft *Windows* version 3.0 has thrown a monkey wrench into many companies' plans to move to a graphical user interface. Conflicting statements about the future direction and capabilities of OS/2 and *Windows* have left users in a quandary.

"It's no wonder people are confused," says Bill Cornfield, president of The Windows Support Group, a New York–based consulting firm, and a developer of *Windows* applications. "One article says [Windows 3.0] is the death of OS/2; another says it's the greatest thing in the world for OS/2."

At least one software company has a solution for users who can't decide which way to go. Informix, of Menlo Park, Calif., plans to include both OS/2 and *Windows*

3.0 versions in each package of its *Wingz* spreadsheet software. The documentation will contain both DOS and OS/2 installation instructions.

Microsoft Corp. reportedly spent $10 million to launch *Windows* 3.0 on May 22. The campaign met with more success than even Microsoft anticipated. Market researchers have doubled the *Windows* 3.0 sales forecast for 1990 and lowered their estimates for OS/2. Dataquest, for example, originally predicted sales of 1 million copies of *Windows* in 1990 and 500,000 copies of OS/2. But the San Jose, Calif., firm now predicts sales of 300,000 copies of OS/2 and 2 million of *Windows*.

OS/2 is definitely the loser in this new popularity contest. Most industry analysts (and Microsoft CEO Bill Gates) are revising downward their estimates of OS/2's immediate usefulness to corporate clients. They are almost unanimously recommending that efforts be directed toward *Windows* implementation, support, and applications development. Says William Bluestein, an analyst with Forrester Research, of Cambridge, Mass., "We're advising clients to put off OS/2 [implementation] until late 1991 or early 1992."

Corporate PC managers such as Wolfgang Schimeck agree. "We get more from *Windows* 3.0 than from OS/2," he says. Schimeck, supervisor of client services for Northwestern Utilities in Edmonton, Alberta, originally planned to migrate his 600 PC users directly to OS/2. "Now," he says, "*Windows* 3.0 has made it less important."

Other companies, as well, are losing interest in OS/2. In general, there are three main reasons for their preference for *Windows*. First, most users believe that OS/2 requires a more expensive hardware platform than *Windows* does, even though the two environments have roughly the same hardware requirements. You *can* run *Windows* 3.0 on an 80286 computer with 640K of memory in its least-capable Real mode, but *Windows*' Enhanced mode, which lets you run multiple non-*Windows* DOS applications simultaneously, requires an 80386 computer with at least 2 megabytes of RAM. For OS/2 you need a '286 or '386 PC with at least 2.5 megabytes.

The second, more substantive reason is that OS/2, in its current state, was designed for 80286 machines and cannot exploit the superior memory-management features of the 80386 and 80386SX systems now in vogue at most corporations.

The third reason is twofold: *Windows* programs are currently incompatible with OS/2–Presentation Manager programs, and many more applications are available for *Windows* than for OS/2–Presentation Manager. Microsoft officials estimate that there are six *Windows* programs for every OS/2–Presentation Manager program. And Carole Patton, editor and publisher of *Acknowledge The Window Letter*, an industry newsletter based in Mendham, N.J., predicts that the anticipated popularity of *Windows* 3.0 will lure even Macintosh software developers. This portends an even wider gap between the numbers of *Windows* and Presentation Manager applications–a gap that won't soon narrow.

However, there are some users who remain skeptical of *Windows* 3.0. "Halfway to the real thing" is what Washington, D.C., computer attorney Mark Ryland calls it. "It seems a mistake to invest time and energy in a transitional system," he says, "especially when the real thing is almost ready." The real thing, according to Ryland, is OS/2. And the forthcoming OS/2 version 2.0 will support the 80386's virtual-8086 mode, which will remove a major barrier to acceptance of OS/2: its inability to run MS-DOS applications outside of its DOS compatibility box. Still, concedes Ryland, "OS/2 has a very bad image, and *Windows* 3.0 makes more sense for now."

Most observers, including Basil W. Maloney Jr., executive director of the Windows & Presentation Manager Association in Richardson, Tex., think that for the next two or three years, OS/2 will remain limited to a small number of high-end, "mission-critical" applications that demand its more-robust capabilities. Programs requiring communications, real-time data aquisition, and computational speed run best under OS/2. "The commitment [by corporations] was always to develop mission-critical applications in OS/2," says Maloney.

Yet even OS/2's technical superiority won't convince employees of the City of San Carlos, Calif. "*Windows* 3.0 was a no-brainer," says assistant city manager Brian Moura. "Who wouldn't want Macintosh functionality for [an upgrade price of] $49?"

—*Garry Ray*

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CIRCLE 105 ON READER SERVICE CARD

IS THE PEN MIGHTIER THAN THE KEYBOARD?

Portables with a stylus instead of a keyboard improve business operations.

At Best Foods Baking Group, Fairfield, N.J., pen-based PCs are replacing hand-held calculators and paper forms

In the beginning, there was the keyboard. Then came the mouse. Now, in an effort to make PCs accessible to more people in more places, some computer makers and businesses are turning to an even more intuitive instrument: the pen.

Desktop and hand-held computers that have a special stylus for entering information and executing commands are in use in rail yards, supermarkets, and other businesses. The systems use various handwriting-recognition technologies to interpret hand-printed characters. These technologies are still in their infancy–they won't recognize even the most elegant script, for example–but they do let users fill out forms and do other types of limited data entry without a keyboard. While the pen interface is not expected to replace the keyboard for most word-processing and spreadsheet chores, it is expected to bring the benefits of automation to many who still get by with pencil and paper.

"The most natural means of communication are the pen and the voice," notes William Lempesis, an analyst who follows pen-based technologies for Dataquest, a market research firm in San Jose, Calif. "And for many tasks, only the pen makes sense."

Portable and practical. Typically, these are "clipboard" tasks that require people to fill out paper forms. They are common in field sales, accident reporting, health care, and other areas in which portability is essential but laptop computers are impractical. With a pen-based system, a sales rep, police officer, or health professional can fill out an on-screen form and later transfer the data to another computer. These applications could potentially reach millions of people who don't now use a PC in their jobs.

Grid Systems Corp., best known for its rugged laptops, gave the pen-based market a kick start last fall when it introduced a portable, electronic tablet called the GridPad ($2,370 and up). The clipboard-size, 4.5-pound unit has a 10-inch LCD screen and a tethered pen. It can recognize signatures and graphics, as well as hand printing. The DOS-based system uses an 80C86 microprocessor and comes with a pair of battery-backed RAM cards (256K or 512K) for data storage and an internal 2,400-bps modem. To hedge its bets, as it were, the system comes with a keyboard port, and an optional 3-pound expansion unit adds a 20-megabyte hard disk.

Many businesses that have invested in pen systems are now reaping handsome dividends. Best Foods Baking Group in Fairfield, N. J., for example, outfitted a group of independent distributors with GridPad systems. The pen-based PCs, which replaced hand-held calculators and paper forms, cut an average of 1 ^{1}§$_{2}$hours from the daily in-store routine of the delivery-truck drivers. "They loved it," notes Mark Breitfeller, a systems analyst with Best. "We were heroes."

Best Foods benefits in several ways. For example, the distributors make fewer errors in totaling up sales, which means prompt payment from stores and better cash flow. Also, the flow of data has improved. At the end of the day, delivery workers take the GridPad home and upload sales figures by modem to a computer at company headquarters. "We can be extremely aggressive marketers with this kind of feedback," says Breitfeller.

Stiff competition. The GridPad, which has had the market to itself since its debut, should have plenty of competition in the near future. Canon and Sony Corp. already have pen computers on the market in Japan, and similar products could appear in this country soon. In April Boston-based Scenario Inc. introduced DynaWriter, a pen-based input system for AT-class computers. Pen-based systems are also expected from Momenta Corp. (Mountain View, Calif.) and from Go Corp. (Foster City, Calif.), which is headed by former Lotus Development Corp. technologist Jerrold Kaplan. In addition, several of the major computer manufacturers–including IBM and Apple Computer–have been researching pen-based computers.

Commercial software developers and corporate information managers are beginning to show an active interest, too. Borland International, for example, is reported to be writing applications for the forthcoming Go portable. A recent conference sponsored by Grid on the technical issues surrounding the pen interface and handwriting recognition drew more than 300 participants, most of whom were software writers or potential customers. And Slate Corp. of Scottsdale, Ariz., was recently formed to develop software for pen-based computers.

Developing the software for custom applications like the one Best Foods uses is a critical step, since the GridPad's pen interface does little good without it (although the pen can be used in place of a mouse). Despite the new technology, corporate developers report relatively few difficulties in writing for the GridPad. The Best Foods application, for instance, was developed by one programmer in about three months.

PCs anyone can use. Many businesses stand to recoup all of their up-front development costs in reduced training and support time, particularly among inexperienced computer users. At The Gillette Co.'s Boston-based North Atlantic Shaving and Personal Care Group, for example, managers found that they could train part-time store representatives to use the GridPad in as little as four hours. "These people generally have no computer background," explains John Conley, manager of customer systems. "But using the pen is so natural that we don't have to worry about whether they know how to use a computer or even whether they know how to type."

'NOBODY FEELS COMFORTABLE USING A KEYBOARD IN A BUSINESS MEETING.'

Though the so-called clipboard market is widely viewed as the most promising audience for pen-based computers in the next year or two, the pen's appeal is likely to extend into many other areas in which conventional computers are used sparingly, if at all. Some observers, for example, foresee pen-based applications for executives who review–rather than produce–information. A department manager who now reads printed spreadsheets and reports might instead use a pen-based system to view them and make any changes or comments.

Socially acceptable. There is also talk of a "notebook" market for pen-based systems that can be carried into settings where a normal laptop–because of its bulk and noisy keyboard–doesn't fit in. You could jot down notes and thoughts on a pen-based electronic notebook as unobtrusively as you can on a legal pad. A pen-based PC could even help personal-information managers such as *Lotus Agenda* fulfill their potential. "A product like *Agenda* makes a lot more sense when you can carry it around with you," explains Lotus founder Mitch Kapor, the father of *Agenda*. "I don't think anybody feels comfortable using a keyboard in a business meeting or in social situations."

Kapor says that his current company, On Technology, in Cambridge, Mass., isn't working on any pen-based systems, but he is reported to be backing On Technology's recently departed president, Peter Miller, in a new venture to write software for pen-based PCs. Kapor is also a principal investor in Go Corp., and few people would be surprised to see an *Agenda*-type product emerge from that quarter. Go hasn't announced any specific product plans at this writing, but the company has said it is taking "a much broader view" of the potential for pen-based PCs than the vertical markets targeted by Grid and others. Go intends to target keyboard-phobes among the corporate ranks.

Some observers envision yet another market–for nonportable applications. For example, Scenario's DynaWriter ($1,995), a touch-screen panel that connects to a desktop PC, is designed to help with data entry at stationary locations, from telemarketing cubicles to loading docks. The company also offers a complete '286-based pen system called the DynaWriter Portable PC ($5,750).

The biggest obstacle to the pen's acceptance may be unrealistic expectations. For example, many users may be disappointed to find that they can't write in their normal hand. Companies are working to overcome these limitations, however. IBM, for example, recently developed technology that lets computers recognize overlapping handwritten letters. Vern Raburn, Slate Corp.'s chairman, calls the advance "a step in the progression toward the point at which a computer can recognize whatever you slap down on its screen."

Nonetheless, "it's going to be a while before [the pen interface] is a mass-market technology," concedes Judith Bolger, Scenario's vice president of marketing, "but a Fortune 1000 company with the proper resources can use it right now."

Christopher O'Malley

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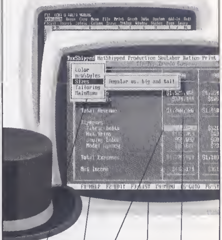
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CIRCLE 106 ON READER SERVICE CARD

Telephone Support News

Software vendors have been taking a lot of heat lately about what customers see as poor service—particularly long waits on the telephone-support lines. Software firms are responding in a variety of ways.

Several companies, including Lotus Development Corp. and Microsoft Corp., have instituted 900-number, caller-paid telephone support. For $2 a minute (the first minute is free), Microsoft (900-896-9000) will provide technical help for all versions of DOS; Lotus (900-454-9009) will answer questions on *1-2-3* Releases 2.2 and 3.

Unfortunately, many people won't be able to use the 900-number support services while they're at work. Large companies often stonewall outgoing calls to the pay-per-minute numbers, according to Harry Newton, publisher of *Teleconnect*, a telephone-industry journal. "You can block out 900-number access on any modern PBX," he says, "and a lot of companies do."

WordPerfect Corp., which is committed to not charging its customers for PC product support, is taking another tack. The company can't guarantee that people who call its toll-free support lines won't have to wait for service. It can, however, guarantee them a live person to talk to while they hold. WordPerfect's "hold jockeys" play music and advertisements for WordPerfect products, discuss scheduled product-release dates, and give you up-to-the-minute reports on how long you'll have to continue to hold.

—Jennifer Smith and Garry Ray

Consumer Reports on CD-ROM

Can't remember which foreign car has the best repair record? Which brand of toothpaste is the least abrasive? You don't have to drag out all your back issues of *Consumer Reports*. Now you can fire up your CD-ROM drive, thanks to a joint effort of the publishers of *Consumer Reports* and National Information Services Corp. (NISC).

CD-ROM subscriptions to *Consumer Reports* come in two flavors. For those who know their way around CD-ROM libraries and database-search software, there's the advanced subscription ($695 per year), which contains issues from January 1982 to the present. The beginner's subscription ($445 per year) goes back only to January 1985 and features a somewhat friendlier interface modeled after the magazine's table of contents and index.

Both subscriptions include quarterly updates and can run on any CD-ROM drive with MS-DOS CD-ROM extensions hooked up to an IBM PC, PC XT, PC AT, PS/2, or compatible computer with 512K of RAM. For more information call NISC at 301-243-0797.

—J. S.

How About 1-2-3/N?

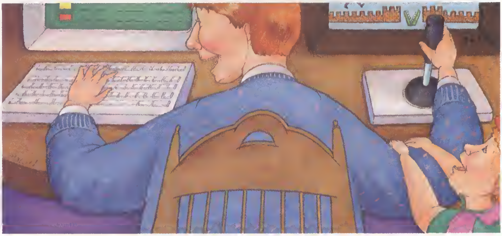
The next time you go computer shopping, don't forget the kids' Super Mario Brothers cartridge. That's right. Nintendo-PC compatibility is finally here.

Duo Computers, of Miami, recently announced its Duo Family Computer, a $999 IBM PC–compatible (a NEC V-20) system with a slot for Nintendo game cartridges. The company claims that this dual-mode system will run both MS-DOS programs and Nintendo games flawlessly, using a standard television to display Nintendo action—or CGA, EGA, or VGA graphics for your PC programs.

You probably won't want to run a text-mode VGA program on the television, admits Duo President Leigh Rothschild, so the system provides a second display port for an EGA or VGA monitor. Such a setup, says Rothschild, makes it possible to "run Nintendo on the TV while you run a DOS program on the monitor."

With choices like that, you probably won't know whether to grab a magic ring or hit Recalc.

—G. R



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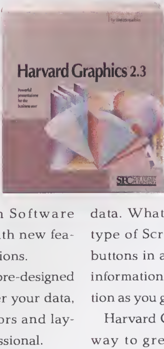

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Lotus Sues Borland; Wins its Paperback Suit

Lotus Development Corp. prevailed in its three-year-old copyright-infringement suit against Paperback Software International and brought a similar suit against Borland International and The Santa Cruz Operation.

In his June 28 decision, Judge Robert E. Keeton of Federal District Court in Boston ruled that Paperback Software of Berkeley, Calif., and its Canadian development partner, Stephenson Software of Vancouver, British Columbia, violated Lotus's copyright by imitating the appearance and command set of *1-2-3* Releases 1A and 2.01 in its spreadsheet program *VP-Planner*. At press time, Lotus expected to ask for an injunction barring Paperback Software from selling *VP-Planner*.

"[The] decision is...good news for developers who, without protection, might find it infeasible to market their creations," says Tom Lemberg, Lotus vice president and general counsel.

Four days after the Paperback Software ruling, Lotus filed separate suits charging that *Quattro* and *Quattro Pro*, from Borland International of Scotts Valley, Calif., and *SCO Professional*, from The Santa Cruz Operation (SCO) of Santa Cruz, Calif., violate Lotus's copyrights in *1-2-3* Releases 1A and 2.01.

"In developing *Quattro* and *Quattro Pro* and *SCO Professional*, Borland International and The Santa Cruz Operation have copied the *1-2-3* commands and menu structure virtually in their entirety," said Lemberg in a press release. "These are specific elements that the court ruled cannot be copied."

In the 113-page Paperback Software decision, Judge Keeton called *1-2-3*'s user interface "its most unique element." He ruled that "a menu command structure is capable of being expressed in many...ways" and noted that *Microsoft Excel* and other spreadsheets have dissimilar menus.

Lotus's original suit also charged Mosaic Software of Boston with copyright violation, but the cases were separated, and Mosaic will stand trial at a future date.

1-2-3 on Capitol Hill

Beginning August 1, Lotus will maintain an electronic bulletin-board service for federal government users (access number 703-527-2282). The company plans to post information on Lotus products, product demos, printer drivers, and schedules for weekly government product seminars.

Government editions of Lotus software are available through Egghead Discount Software, 800 Software, Government Technology Services, Softmart, Software House, and other Lotus-authorized government resellers. For more information, call 800-343-5414.

1-2-3 Speaks More Unix Dialects

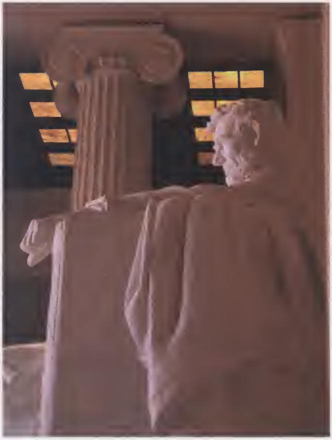
An estimated 70% of all computer contracts put out for bid by Uncle Sam include provisions for Unix systems. It's no surprise, then, that Lotus Development Corp. is adding to its family of spreadsheets for the Unix operating system.

First there was *1-2-3* for Sun Microsystems' three SunOS Unix-based platforms. Now there's *1-2-3 for Unix System V*, a Release 3–based version for PCs running Unix System V Release 3.2. Lotus plans to supply versions of *1-2-3* for four industry-standard dialects of Unix System V Release 3.2: AT&T Unix System V/386, Santa Cruz Operation (SCO) Unix System V/386, SCO Xenix System V/386, and Interactive Unix System V. The SCO Unix and Xenix flavors are available now; Lotus expects to release the AT&T and Interactive flavors in the third quarter.

"We chose these initial versions of Unix System V for their combined installed base and mature distribution channels," says David Rome, Lotus's director of Unix products. Eventually, he says, Lotus will support other versions of the operating system.

The program is aimed at public- and private-sector users of Unix System V, for manufacturing, accounting, transportation, health-care, finance, and point-of-sale applications. Industry analysts estimate that there are currently more than 500,000 '386 PCs worldwide running Unix System V and Xenix System V.

1-2-3 for Unix System V is completely file-, macro-, and keystroke-compatible with earlier versions of *1-2-3*. It requires a Compaq, IBM, or compatible 80386-based PC, 4 megabytes of RAM, 5 megabytes of free disk space, and one of the following operating systems: AT&T Unix System V/386 Release 3.2; SCO Unix System V/386 Release 3.2; SCO Xenix System V/836 Release 2.3; or Interactive Unix Operating System V version 2.2 (formerly known as 386/ix).



■ **With its Unix spreadsheets** and new bulletin-board service, Lotus hopes to capture a bigger slice of the government market.

The program costs $695 for the single-user edition and $1,295 for the multiuser edition, which is installed on an 80386-based file server and licenses up to 10 users. A $495 additional-user edition provides one set of documentation and four more network licenses. Extra sets of documentation cost $60 each. The product will be distributed through Electrorep Datacomm Products, Ingram Micro D, MicroAge, Softmart, Merisel International, Software Spectrum, Univar, and Government Technology Services.

Freelance Plus for Networks

Network editions of *Lotus Freelance Plus* 3.01, Lotus's presentation-graphics package, have begun shipping. Standard, Server, and Node editions of *Freelance Plus* 3.01 are priced at $495, $695, and $395, respectively.

Freelance Plus 3.01 network editions run under network operating systems compatible with DOS 3.1 and higher, including IBM PC LAN Program versions 1.2 and 1.3 (requires DOS 3.3), 3Com 3+Share version 1.3, Novell SFT NetWare version 2.15, and Banyan Vines/3.0.

Users of *Freelance* 1.0 and *Freelance Plus* 2.0/2.01 may upgrade to the Standard or Node edition for $100. Current *Freelance Plus* 3.0/3.01 users who want to run the program from a network may simply transfer their Standard-edition licenses to Node-edition licenses. For upgrade information, call Lotus Selects at 800-635-6887, call 800-TRADEUP, or contact a Lotus-authorized dealer.

1-2-3/M for New Operating Systems

1-2-3/M, Lotus Development Corp.'s Release 3–based spreadsheet for IBM's System/370, is now available for five additional versions of the MVS and VM operating environments: MVS/XA JES 3, MVS/SP, MVS/ESA, VM/SP6, and VM/XA.

"The early feedback from IBM and Lotus customers is that *1-2-3/M* will be central to the cost-effective development of true enterprise-wide applications," says Frank Moss, vice president of Lotus's Consulting Services Group and acting vice president of the Networked Applications and Systems Division.

For example, National Semiconductor Corp. of Santa Clara, Calif., is using *1-2-3/M* as the hub of a manufacturing and product-performance monitoring system for its domestic and Asia-Pacific operations. "We view this as the first of many applications we plan to build around *1-2-3/M*," says Judy Armstrong, manager of end-user computing for National Semiconductor.

1-2-3/M is sold by IBM in the U.S. and worldwide. Prices are based on processor size and range from $15,360 to $47,470, not including monthly license charges, which range from $583 to $1,800.

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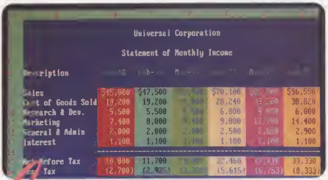

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Statement of Monthly Income

Description	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sales	$45,000	$47,500	[illegible]	$70,100	[illegible]	$96,550
Cost of Goods Sold	18,200	19,200	[illegible]	28,240	[illegible]	38,820
Research & Dev.	5,500	5,500	[illegible]	6,000	[illegible]	6,000
Marketing	7,400	8,000	[illegible]	9,800	[illegible]	14,400
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Interest	1,100	1,100	1,100	1,100	[illegible]	1,100
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Cell References: Available on Request

Relative and absolute references are key to flexible formulas.

BY DANIEL GASTEIGER

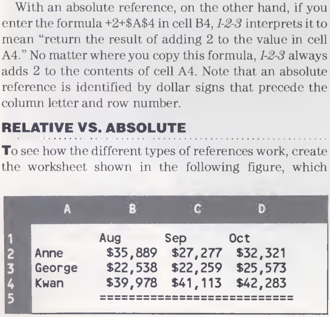
When you copy a formula to a new location in a worksheet, you often want the cell references in the formula to adapt to the new location. That's when you use "relative" cell references. Other times, however, you want a cell reference to remain constant, no matter where you copy the formula. That calls for an "absolute" cell reference. Occasionally, you want only part of the reference–either the column or the row–to adjust when you copy the formula. Then you need a "mixed" cell reference. Using cell references well enables you to build versatile formulas.

To understand how relative references work, consider this. To you, the simple formula +2+A1 entered in cell B1 might mean "add 2 to the value in cell A1." But to *1-2-3* the formula says "return the result of adding 2 to the value that is one cell to the left." That's the essence of a relative cell reference, which is the default. No matter where you copy this formula, the cell referenced in it will always be the cell immediately to the left of the cell containing the formula. Even if you copy the formula to cell IV900, *1-2-3* still interprets it to mean "return the result of adding 2 to the value that is one cell to the left," or +2+IU900.

With an absolute reference, on the other hand, if you enter the formula +2+$A$4 in cell B4, *1-2-3* interprets it to mean "return the result of adding 2 to the value in cell A4." No matter where you copy this formula, *1-2-3* always adds 2 to the contents of cell A4. Note that an absolute reference is identified by dollar signs that precede the column letter and row number.

RELATIVE VS. ABSOLUTE

To see how the different types of references work, create the worksheet shown in the following figure, which contains monthly sales totals for three employees.



	A	B	C	D
1		Aug	Sep	Oct
2	Anne	$35,889	$27,277	$32,321
3	George	$22,538	$22,259	$25,573
4	Kwan	$39,978	$41,113	$42,283
5		========	========	========

Enter the labels shown in row 1 and column A. Enter the values shown in range B2..D4, but don't enter the dollar signs and commas. Rather, after you enter the values, select /Range Format Currency, enter 0, and specify range B2..D4 to assign the Currency format with no decimals to that range. To create the dashed line in row 5, enter the characters \= in cell B5. Then select /Copy and specify cell B5 as the range to copy from and range C5..D5 as the range to copy to.

As a review of relative cell references, let's use a formula that totals the monthly sales of a three-person sales force. Enter the formula @SUM(B2..B4) in cell B6. This formula tells *1-2-3* to sum the values that are two, three, and four cells above the cell containing the formula. Copy cell B6 to range C6..D6. The formulas that result in cells C6 and D6 are @SUM(C2..C4) and @SUM(D2..D4), respectively.

Now suppose you need a formula that calculates each salesperson's percentage of the total sales in August. To do this, the formula must divide each salesperson's monthly sales amount by the total at the bottom of the August column.

Let's start by entering the formula that calculates Anne's percentage of total August sales. Enter the formula +B2/B6 in cell E2. The formula returns 0.364707, indicating that her sales accounted for about 36% of the August sales.

Since that formula worked in cell E2, you might think that it can correctly return the percentages for George's and Kwan's August sales. Try it. Copy cell E2 to range E3..E4. The copied formulas return ERR.

To understand what went wrong, consider how the formula references changed in each copy. The formula tells *1-2-3* to divide the value that is three cells to the left by the value that is three cells to the left and four cells down. In cell E3 the copied formula is +B3/B7, while in cell E4, it is +B4/B8. Cells B7 and B8 contain no data. And since division by 0 is impossible, *1-2-3* returns ERR.

To return correct results when you copy the formula down the column, the original formula needs an absolute cell reference to cell B6, the total August sales figure. Move the cell pointer to cell E2 and enter the formula

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+B2/$B$6. Now copy cell E2 to range E3..E4. Move the pointer to cell E3 and see that the formula reads +B3/$B$6. Move the pointer to cell E4 and see that the formula reads +B4/$B$6. No matter where you copy this formula, the absolute cell reference will always refer to the total August sales figure.

THE ABS KEY

Istead of manually inserting the dollar signs that make a cell reference absolute, you can call on the ABS key (F4 on most computers). When you type a formula, press the ABS key just after you type the address of the cell or range whose reference should be absolute. When you use Point mode to create a formula, position the pointer in the cell or range whose reference should be absolute and press the ABS key.

To test this, use Point mode to re-create the percentage formula. Rather than entering the formula in a new column, erase the formulas that you just created in column E. Select /Range Erase and specify range E2..E4. Then move the cell pointer to cell E2. Type a plus sign and press the LeftArrow key three times. Type a division sign (/), press the LeftArrow key three times, and then press the DownArrow key four times. Now press the ABS key. *1-2-3* inserts dollar signs in the reference to the currently highlighted cell. Press Return to accept the formula.

MIXED REFERENCES

To calculate the August percentages for the other two salespeople, you could copy the formula you just entered in cell E2 to range E3..E4. But wait a moment. Suppose you want to calculate percentages for September and October, too? Because of the absolute cell reference to cell B6, the formula you just wrote won't do the job. One solution is to write two additional formulas, one for each month. But here's a better option: Use a single formula with a mixed cell reference.

In the formula currently in cell E2, the absolute cell reference $B$6 locks the formula into a specific cell. That's because both the column letter and the row number are absolute. A mixed reference, however, can lock a formula into a single column, while letting the row reference remain relative; or it can lock a formula into a single row, while allowing the column reference to remain relative. In *1-2-3* Release 3, a few more options exist, because sheet references can be either absolute or relative.

Let's rewrite the formula so that it calculates the percentages for all three months. You want each copy of the formula to refer to a different person's monthly sales total. Therefore, the reference to cell B2 should remain relative so that as you copy the formula to range E1..G4, the reference adjusts both columnwise and rowwise. But you also want each formula divided by a particular value in row 6, and as you copy the formula across columns, you want the column reference to change. This calls for a relative column reference and an absolute row reference.

Edit the formula in cell E2 to reflect these changes. With the cell pointer in cell E2, press the EDIT key (F2 on most computers). A copy of the formula appears on the edit line. Press the LeftArrow key until the cursor is directly beneath the dollar sign immediately to the right of the slash. Press the Delete key to remove the dollar sign and then press Return. The edited formula reads +B2/B$6. The only absolute reference is to row 6. The other references will adjust as you copy the formula across the worksheet.

Try it. Select /Copy and specify cell E2 as the range to copy from. Specify range E2..G4 as the range to copy to. If you wish, format the range for percentages with no decimal places. Select /Range Format Percent, enter 0, and specify range E2..G4.

Now look at the results. Each formula in the range calculates a particular employee's sales percentage for a specific month. For example, the formula in cell E3, +B3/B$6, calculates George's August sales as 23% of total August sales. The formula in cell F2, +C2/C$6, calculates Anne's September sales as 30% of total September sales. The formula in cell G4, +D4/D$6, calculates Kwan's October sales as 42% of total October sales.

When you use Point mode to create a formula, use the ABS key to mix relative and absolute references. To see how this works, move the pointer to cell E2 and follow this procedure to re-create the formula already in that cell. Type a plus sign and then press the LeftArrow key three times. Type a division sign, press the LeftArrow key three times, and then press the DownArrow key four times. Now press the ABS key and watch the reference to cell B6 change in the control panel.

With the first key press, the formula reads +B2/$B$6. Press the ABS key again, and the formula reads +B2/B$6. A third press yields +B2/$B6. A fourth press restores the original relative reference, +B2/B6. Press the ABS key two more times to produce, once again, the desired reference, +B2/B$6. Finally, press Return to enter the formula in cell E2.

Used properly, cell references can save you time, because they allow one formula to do the work of many. But don't despair if the first few formulas you write using absolute and mixed formulas fail to produce the results you expect. If you get stuck, write the formula using only relative cell references. Then think about where you need to copy the formula and make the appropriate adjustments to the cell references.

Daniel Gasteiger is a *1-2-3* and *Symphony* consultant in Boston and a contributing editor to *LOTUS*.

Manage Those Macros

Try the {DISPATCH} command when a macro library becomes too big to control.

BY NICHOLAS DELONAS

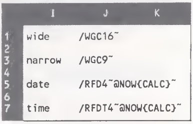
ROGER LEYONMARK

It doesn't take long to build up hefty libraries of macros, and it's not unusual to have applications with lots of hard-to-remember, single-key macro names. In these situations the little known {DISPATCH} command can be a real blessing to Release 2.01 users. {DISPATCH} lets you give macros more-meaningful, multicharacter names that are easy to remember. Because the command doesn't restrict the number of macros allowed in a library, you can make your library even larger than it is now. And developers will find this command useful for testing macros when they build large applications.

Like the {BRANCH} command, {DISPATCH} passes macro control to a specific cell. Both commands use a single argument, which is a cell reference. {BRANCH *address*} passes macro control directly to the cell named *address*. {DISPATCH *address*} passes control not to *address* but rather to the cell identified by a label stored in *address*. The *address* argument must be the cell address or range name of a macro. So if cell A1 contains the label *runaway*, then the command {DISPATCH $A$1} branches macro control to the cell named *runaway* if that cell exists.

RUN MACROS AUTOMATICALLY WITH {DISPATCH}

The most common use of {DISPATCH} is to select from a variety of macro routines. Consider the small macro library shown in figure 1. This library contains four macros, each of which performs a simple action. The *wide* macro sets the default column width to 16. The *narrow* macro resets the default column width to 9. The *date* macro enters today's date in the current cell and formats that cell according to the international date format. Similarly, the *time* macro enters the time in the current cell and formats that cell according to the international time format.



	I	J	K
1	wide	/WGC16~	
2			
3	narrow	/WGC9~	
4			
5	date	/RFD4~@NOW{CALC}~	
6			
7	time	/RFDT4~@NOW{CALC}~	

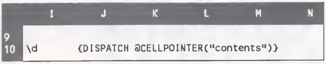
FIGURE 1. Macro names are easier to remember if you use descriptive names rather than backslashes followed by a single letter.

In many libraries of this kind, users assign single-character names to these macros: *\w*, *\n*, *\d*, and *\t*. That's fine when the library has only four macros, but what if it has twenty? In large libraries, single-letter macro names become hard to remember. That's where the {DISPATCH} command comes in.

To see how to use this command, create the macro library in figure 1. Enter all labels as shown, remembering to preface each label in column J with an apostrophe. Press slash, select Range Name Labels Right, and indicate range I1..I7. This assigns the labels in column I as range names for the adjacent cells in column J.

Now enter the labels as shown in figure 2. Use the Range Name Labels Right command to assign the label in cell I10 as a range name for cell J10.

The *\d* macro runs the macro identified by the current cell. To see how this works, move the cell pointer to cell I1. Now hold down the MACRO key (Alt on most



```
     I       J        K        L        M        N
9
10   \d      {DISPATCH @CELLPOINTER("contents")}
```

FIGURE 2. Create this macro to run any macro that is identified by the label in the current cell.

computers) and press D. The *\d* macro dispatches macro control to the *wide* macro, which widens all the columns in the worksheet.

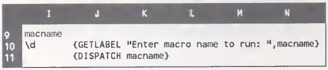
Move the cell pointer to cell I3 and press MACRO-D to reset the column widths.

This use of the {DISPATCH} command is helpful when developing large applications. You can run macro routines simply by moving the cell pointer over the macro's identifying label. Many people also use this technique when developing full-screen, custom menus (see "How to Create a Vertical Light-Bar Menu" in the October 1989 issue of *LOTUS*).

However, this technique has a serious drawback. You can't use it to run any macro that alters the current cell. Thus you can't use the *\d* routine to execute the *date* or *time* macros because they overwrite the contents of the current cell with the date or time.

ANOTHER METHOD

Figure 3 shows another technique for dispatching control to a macro. Enter labels as shown. Use the Range Name Labels Right command to assign the label in cell I9 as a range name for cell J9. Then move the cell pointer to a blank cell and press MACRO-D.



```
     I       J        K        L        M        N
9    macname
10   \d      {GETLABEL "Enter macro name to run: ",macname}
11           {DISPATCH macname}
```

FIGURE 3. This *\d* macro prompts you for the name of the macro you want to run.

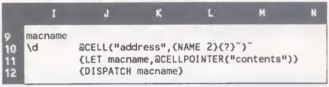
The new *\d* macro prompts you to enter the name of a macro. Enter *date*. The *\d* macro dispatches control to the *date* macro, which enters the date in the current cell and formats it.

Here the *\d* macro uses the {GETLABEL} command in order to find out which macro you want to run. It stores your response in the cell named *macname* and then uses that cell to identify the macro to which you want to dispatch control. It passes control by using the {DISPATCH} command.

This technique is useful for distributing macro libraries to fellow workers. It requires that the user know the name of the macro and thereby prevents the user from running unfamiliar macros. On the other hand, typing out the full name of the macro often isn't much easier than completing the tasks by hand. But there are several ways to streamline the process.

MAKE A MACRO MENU

One solution is to make the *\d* macro display a list of macro choices, which you can highlight and select. To create such a macro, enter labels as shown in figure 4. Be sure to start the label in cell J10 with an apostrophe.



```
     I       J        K        L        M        N
9    macname
10   \d      @CELL("address",{NAME 2}{?}~)~
11           {LET macname,@CELLPOINTER("contents")}
12           {DISPATCH macname}
```

FIGURE 4. By starting an @CELL formula and then pressing the NAME key, this version of *\d* lets you select the macro to run from a full-screen listing.

Move the cell pointer to a blank cell and press MACRO-D. The macro displays a full-screen listing of all the range names in the worksheet. Highlight *time* and press Return. The *\d* macro dispatches control to the *time* macro, which enters the time in the current cell and formats it.

Here *\d* starts entering an @CELL formula in the current cell. The macro uses "address" as the attribute for that formula. It then presses the NAME key twice to let you select one of the macros from the list of range names for the range argument. When you selected *time*, the macro finished entering the formula @CELL ("address",*time*) in the current cell. Here, that formula returns the string $J$7. The macro uses the {LET} command to copy this address to the cell named *macname* and then dispatches control to cell $J$7, which is the *time* routine.

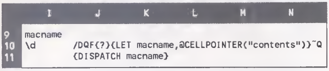
At this point, the *\d* macro essentially duplicates the RUN command in *1-2-3* Releases 2.2 and 3, and users of those products will find that RUN is more convenient than this macro. But taking the {DISPATCH} command one step further can make for a macro that does more than the RUN key.

Consider the example in figure 5. Erase the labels in range J9..J12, and then enter labels as shown. Remember to begin the entry in cell J10 with an apostrophe. Then enter the labels shown in figure 6. These labels form a table that lists the available macros, along with a description of what each macro does.

Select /Data Query Input and enter range A1..A5. Then select Criterion (Criteria in Releases 2.2 and 3) and again enter range A1..A5. Select Quit. Move the cell pointer to a blank cell and press MACRO-D. The macro displays the table of macro descriptions, and the cell pointer highlights *date*. You can move the highlight by pressing the

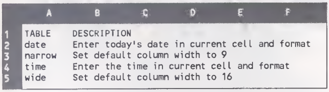
DownArrow and the UpArrow keys. Move the cell pointer to highlight *time* and press Return.

The macro enters the time into the cell where you started and formats it accordingly. Here's how it works:



```
     I          J        K        L        M        N
9    macname
10   \d         /DQF{?}{LET macname,@CELLPOINTER("contents")}~Q
11              {DISPATCH macname}
```

FIGURE 5. A clever use of the Data Query command lets you use the macro *\d* to select a macro from a table of macros.



```
     A          B        C        D        E        F
1    TABLE      DESCRIPTION
2    date       Enter today's date in current cell and format
3    narrow     Set default column width to 9
4    time       Enter the time in current cell and format
5    wide       Set default column width to 16
```

FIGURE 6. This table of macro names and descriptions works with the *\d* macro in figure 5.

/DQF{?}{LET macname,@CELLPOINTER("contents")}~Q selects /Data Query Find and then pauses to let you move the cell pointer around the table. When you press Return, the macro copies the contents of the highlighted cell to the cell named *macname.* The macro then presses Return to get out of Find mode and selects Q to return to Ready mode.

{DISPATCH macname} runs the macro identified by the label in the cell named *macname.*

This {DISPATCH} technique is useful for creating full-screen menus. But it does have its share of problems. For example, you can't store these macros along with their listing table in a Hyperspace macro library in *1-2-3* Release 2.2. The table must be in the worksheet. Furthermore, the table must be in the same column or to the left of the cell pointer when the *\d* macro is invoked. Otherwise, the macro won't display the macro descriptions but only the macro names.

At first, it may be hard to envision situations where the {DISPATCH} command will serve you better than the usual {BRANCH} command. But studying these examples may trigger other ideas for managing macros more effectively. ■

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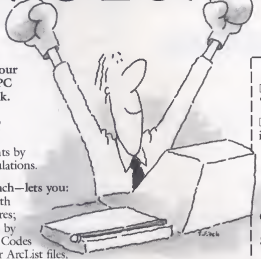

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Speed Up Record Retrieval

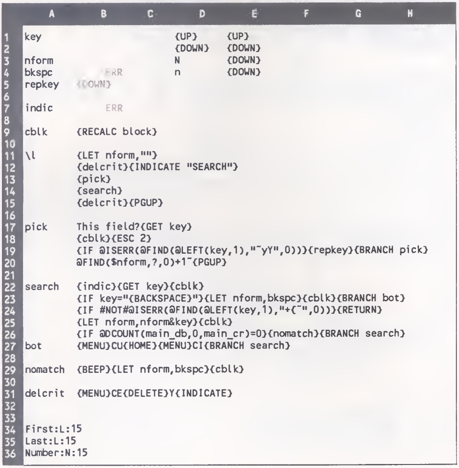
A macro locates matching database records as quickly as you can type the criterion.

BY DANIEL GASTEIGER

Searching through a *Symphony* database is easy when you know exactly what you're looking for. You press MENU in the FORM environment, select Criteria Edit, enter a criterion, press PageUp, and select MENU Criteria Use. If you enter the right criterion, *Symphony* serves up the record you want. But if you enter the wrong criterion, you may have to press the Escape key to clear an error condition. At minimum, you must select MENU Criteria Edit again, enter a new criterion, and then select MENU Criteria Use. After a while, this process gets rather tiresome.

A special utility macro eliminates the tedium from searching. The macro prompts you to identify the database field to search and lets you type the character string to search for. With each character you type, the macro pulls up the first database record that contains the string typed in at that point.

For example, if you type an *L*, the macro displays the first record that contains a capital *L*. If you then type an *e*, the macro displays the first record that contains the string *Le*. When the record you want appears, press Return or Escape. The record remains current.



```
     A          B          C          D          E          F          G          H
1   key                               {UP}       {UP}
2                                     {DOWN}     {DOWN}
3   nform                             N          {DOWN}
4   bkspc            ERR              n          {DOWN}
5   repkey     {DOWN}
6
7   indic            ERR
8
9   cblk       {RECALC block}
10
11  \l         {LET nform,""}
12             {delcrit}{INDICATE "SEARCH"}
13             {pick}
14             {search}
15             {delcrit}{PGUP}
16
17  pick       This field?{GET key}
18             {cblk}{ESC 2}
19             {IF @ISERR(@FIND(@LEFT(key,1),"~yY",0))}{repkey}{BRANCH pick}
20             @FIND($nform,?,0)+1~{PGUP}
21
22  search     {indic}{GET key}{cblk}
23             {IF key="{BACKSPACE}"}{LET nform,bkspc}{cblk}{BRANCH bot}
24             {IF #NOT#@ISERR(@FIND(@LEFT(key,1),"+{~",0))}{RETURN}
25             {LET nform,nform&key}{cblk}
26             {IF @DCOUNT(main_db,0,main_cr)=0}{nomatch}{BRANCH search}
27  bot        {MENU}CU{HOME}{MENU}CI{BRANCH search}
28
29  nomatch    {BEEP}{LET nform,bkspc}{cblk}
30
31  delcrit    {MENU}CE{DELETE}Y{INDICATE}
32
33
34  First:L:15
35  Last:L:15
36  Number:N:15
```

This utility macro works in the FORM environment. It helps you locate records quickly and easily.

BUILD IT AND USE IT

This discussion of the database-search macro makes the most sense when you have a working model to play with. Before continuing with this article, follow the instructions in the setup box to build a practice worksheet. Later in the discussion we'll see how to adapt the macro to any *Symphony* database. Note that the model works best on a sorted database.

To run the macro, start in the FORM window, hold down the MACRO key (Alt on most computers), and press L. The macro displays a blank database record and the prompt *This field?* in the *First* field. Press DownArrow or UpArrow to move the prompt from one field to another or type *n* if you don't want to use the current field.

Move the prompt to the *Last* field, then press Return or type *y*. Now type the character string you want to find. For example, type an *L*. Note that the model's criterion-matching mechanism is case-sensitive, so make sure that you type a capital *L*. After you type an *L*, the word *SEARCH* and the letter *L* appear in the status indicator and Stacy Lieberman's record appears in the form.

Type the letter *i*. The status indicator shows that you've typed *Li*, but this criterion still matches Lieberman, so the form remains unchanged. Type *t*, and June Little's record appears instead of Stacy Lieberman's. If you meant to type *n* rather than *t*, press Backspace. The record for Stacy Lieberman reappears in the window. Then, when you type *n*, Anthony Lincoln's record appears. With each of these changes, the status indicator changes to display the current criterion. Press Return to end the search operation. Anthony Lincoln's record remains current.

Try another search. Start the macro and select the *Last* field. Then type *i*. Murphy Bright's record appears in the form because it's the first record with the character *i* in the last name. Type *n*, and Warf Bingham's record appears. Type *gt* to change the criterion to *ingt*, and George Washington's record appears. Press Return to end the search operation.

THE MAIN MACRO ROUTINE

For simplicity, the macro is divided into several subroutines, which are called from the main routine. The main routine is the collection of commands in range B11..B15. Here's what it does:

{LET nform,""} places a null string ("") in the cell named *nform*. Later, the macro uses *nform* to store the criterion that you type. A null-string criterion matches any label entry.

{delcrit}{INDICATE "SEARCH"} calls the routine named *delcrit*, then sets the status indicator to read *SEARCH*. The *delcrit* routine selects MENU Criteria Edit, presses Delete, and selects Yes. This erases any existing criterion and leaves a blank criterion record on the screen.

{pick} calls the routine named *pick*, in which you select the database field that you want to search.

{search} calls the routine named *search*. This routine lets you type a criterion in the blank criterion record, then locates any database records that contain that character string.

{delcrit}{PGUP} calls *delcrit* to erase the criterion record that you created and to clear the status indicator. The macro then presses PageUp to exit from the criterion record and to return you to *Symphony*'s FORM window.

PICK A FIELD

The first two lines of the macro initialize the worksheet by erasing the cell named *nform* and clearing the preexisting criterion. The *pick* routine prompts you to select the database field to search:

This field?{GET key} types the characters *This field?* into the *First* field of the criterion record, then pauses until you press a key. The macro stores your keystroke in the cell named *key*.

NOTE THAT THE MODEL'S

CRITERION-MATCHING

MECHANISM IS

CASE SENSITIVE.

{cblk}{ESC 2} calls the routine named *cblk*, and then presses Escape twice. The *cblk* routine recalculates the formulas in the range named *block* (B1..B7) so that they reflect changes to the cells named *key* and *nform*. Without this subroutine, you would have to write the command {RECALC block} four times in the macro. Pressing Escape twice removes the *This field?* prompt from the current field.

{IF @ISERR(@FIND(@LEFT(key,1),"~yY",0))} {repkey}{BRANCH pick} determines whether you pressed the Return key or typed the letter *y*. If you didn't press either of these keys, the macro calls the *repkey* routine, then branches to the *pick* routine.

The cell named *repkey* is part of the range named *block*. It contains a formula that searches for your keystroke in the left column of the table named *transtab*. If your keystroke isn't in *transtab*, the formula in *repkey* returns a null string. If your keystroke is in *transtab*, the formula returns the corresponding command from the right column of the table. For example, if you press *n* in response to the *This field?* prompt, the formula in *repkey* returns the command {DOWN}.

Therefore, if you don't select the current field by pressing Return or typing *y* at the prompt, the cursor moves up one field, moves down one field, or remains where it is. In any case, macro control immediately shifts back to *pick*, so the *This field?* prompt reappears in whatever field is current. It all happens so quickly that the *This field?* prompt looks like a cursor moving from one record to another.

When you press Return or type *y*, this looping ends. Then macro control passes to the next command in the column:

**@FIND($nform,?,0)+1~{PGUP}** enters the criterion formula into the current field, then presses PageUp to exit from the criterion record. The criterion formula @FIND($nform,?,0)+1 means "match any record that contains the string found in *nform*."

MATCHING THE CRITERION

The *pick* routine sets the stage for the *search* routine. In the *pick* routine, you select a field to search and the macro enters a criterion formula that will match labels in *nform*. As you might expect, the *search* routine manipulates the entry in *nform*:

{indic}{GET key}{cblk} calls the routine named *indic*, pauses until you press a key, stores your keystroke in *key*, then calls the routine named *cblk*.

The cell named *indic* contains a formula that returns an {INDICATE} command. This command displays the current criterion in the status indicator. The {INDICATE} command's argument cannot be a cell address. It must be the literal character string. The formula in *indic* combines the characters *{INDICATE* with the characters in *nform* and adds a closing brace (}).

The key that you press at this point should be the first letter in the character string that you wish to find in the database. Once that character is in *key*, the *cblk* routine updates the formulas in *block*.

{IF key="{BACKSPACE}"}{LET nform,bkspc}{cblk}{BRANCH bot} assigns the value of the cell named *bkspc* to *nform* if you press the Backspace key. The cell named *bkspc* contains a formula that returns the label in *nform* minus its rightmost character. Thus, pressing the Backspace key simply erases the last character from the criterion in *nform*. If *nform* contains only a label prefix,

HOW TO SET UP THE DATABASE-MATCHING WORKSHEET

1. Releases
This model will run in *Symphony* Release 2.0.

2. Labels
Enter labels as they appear in columns A, B, D, and E of the figure. Omit, for now, the three entries shown in color at the top of column B. Those are formulas that you'll enter in a moment. Remember to preface the entries in cells A11 and B20 with an apostrophe.

3. Range names

Name	***Range***
bkspc	B4
bot	B27
cblk	B9
delcrit	B31
indic	B7
key	B1
nform	B3
nomatch	B29
pick	B17
repkey	B5
search	B22
V	B11
block	B1..B7
transtab	D1..E4

Assign the first 12 names by selecting MENU Range Name Labels Right and indicating range A1..A31. Use the Range Name Create command to assign the names *block* and *transtab*.

4. Formulas
Enter formulas in the cells indicated.

Cell	***Formula***
B4	@IF(nform="","",@LEFT (nform,@LENGTH(nform)–1))
B5	@IF(@ISERR(@VLOOKUP (key,transtab,1)),"",@VLOOKUP (key,transtab,1))
B7	+"{INDICATE "&nform&"}"

5. The database
Press the TYPE key (Alt-F10) and select FORM. The window clears, and the error message *No Definition range defined* appears in the control panel. Press MENU, select Generate Label, and press Return to accept the default field length. Make sure that the name of the database settings sheet is MAIN. If you haven't changed the default start-up window name, MAIN appears as the only selection in the control panel, so just press Return. If a word other than MAIN appears, type *main* and press Return. Finally, highlight range A34..A36 after the prompt *Range of field names*, then press Return.

6. Database entries
Enter the following data in the fields indicated:

First	***Last***	***Number***
Murphy	Bright	2170
Warf	Bingham	4873
Stacy	Lieberman	8879
Anthony	Lincoln	3737
June	Little	9963
Jean	Sleem	2229
George	Washington	7733

For example, to enter the first record, with the cursor in the *First* field, type *Murphy* and press Return. The cursor moves to the *Last* field. Type *Bright* and press Return. Enter *2170* in the *Number* field, then press the Insert key. You're ready to enter the next record.

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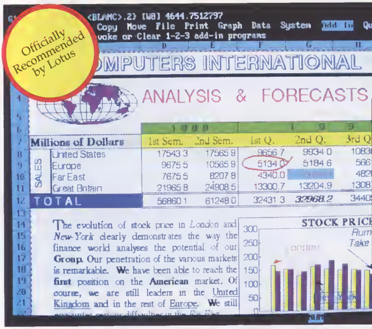
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	Europe	9675 5	10565 9	5134 0	5184 6	566
	Far East	7675 5	8207 8	4340.0		482
	Great Britain	21965 8	24908 5	13300.7	13204.9	1308
TOTAL		56860 1	61248 0	32431 3	32968.2	3440

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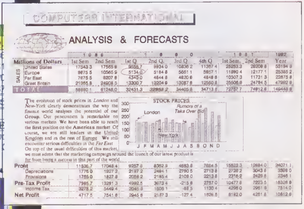

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CIRCLE 109 ON READER SERVICE CARD

the *bkspc* formula returns a null string.

The macro then updates the formulas in *block* and transfers control to the cell named *bot*. The commands in *bot* update the database window so that the first record that matches the criterion is displayed.

{IF #NOT#@ISERR(@FIND(@LEFT(key,1),"+{~", 0))}{RETURN} determines whether *key* contains a nonalphanumeric character, which indicates to the macro that you've found the record you want and that the *search* routine should end. Since most nonalphanumeric characters appear as keywords enclosed in braces, this command examines only the leftmost character in the cell named *key* to determine whether you pressed a nonalphanumeric key.

{LET nform,nform&key}{cblk} appends the character in *key* to the label in *nform*, then recalculates *block*. This command takes effect only if the previous two commands haven't superseded it. By adding the newly typed character to *nform*, the macro alters the criterion.

{IF @DCOUNT(main_db,0,main_cr)=0}{nomatch} {BRANCH search} determines whether there is any record in the database that matches the criterion and calls the routine named *nomatch* if there is none. Then the macro restarts the *search* routine so that you can add a different letter to the criterion.

{BEEP}{LET nform,bkspc}{cblk} in the *nomatch* routine causes your computer to beep, then replaces the label in *nform* with the label calculated in *bkspc*. This happens quite quickly. All that you perceive is the beep, which signals that the string that appears in the status indicator has no match in the database.

If the string in *nform* does have a match in the database, control passes to *bot*:

{MENU}CU{HOME}{MENU}CI{BRANCH search} selects MENU Criteria Use and presses Home. Then the macro selects MENU Criteria Ignore and transfers control to the beginning of the *search* routine. These commands cause *Symphony* to display the first record that matches the criterion. The *search* routine runs each time you add a character to the criterion. The routine ends, as does the macro, when you press Return.

OTHER DATABASE SCENARIOS

This macro has some shortcomings that aren't easily overcome. One shortcoming is that the macro works only with a database named *main*, a main Database range named *main_db*, and a Criterion range named *main_cr*. If you want to use the macro with another database, you must alter the {IF} command in cell B26 so that its @DCOUNT function refers to the appropriate Database range and Criterion range.

To make the macro easier to edit for various databases, add two named cells, such as *database* and *crit*. Then replace the characters *main_db* in cell B26 with the expression @@(database), and replace the characters *main_cr* in that cell with the expression @@(crit). Enter the name of the Database range in the cell named *database*, and enter the name of the Criterion range in the cell named *crit*. You may prefer to write another macro that prompts you for the names of the Database and Criterion ranges each time you run the macro. This could confuse other users of your model, however.

THE *SEARCH* ROUTINE RUNS EACH TIME YOU ADD A CHARACTER TO THE CRITERION.

The macro's second shortcoming is that as written, it doesn't work in a macro library. However, you can modify it so that it will work in any worksheet that contains a database named MAIN and a cell named *form*, specifically for the macro's use.

Add a subroutine named *asgn* whose only command is {LET form,nform}. Then modify the macro's code as follows:

Cell	***New Code***
B11	{LET nform,""}{asgn}
B20	@FIND($form,?,0)+1~{PGUP}
B23	{IF key="{BACKSPACE}"}{LET nform,bkspc}{cblk}{asgn} {BRANCH bot}
B25	{LET nform,nform&key}{cblk}{asgn}
B29	{BEEP}{LET nform,bkspc}

When you place the macro in a macro library, make sure that you send along everything in range A1..E31, as well as the *asgn* subroutine. (See "Macros in Space" in the June issue, page 28, for a detailed discussion of Hyperspace.)

In every worksheet in which you intend to use the Hyperspace macro, assign the name *form* to some out-of-the-way cell. As long as the worksheet's database is named *main* and its corresponding Database and Criterion ranges are named *main_db* and *main_cr*, the macro will find records for you as quickly as you can type a criterion.

Daniel Gasteiger is a *1-2-3* and *Symphony* consultant in Boston and a contributing editor to *LOTUS*.

The model in this article can be downloaded from CompuServe. For more information, see the box on page 4.

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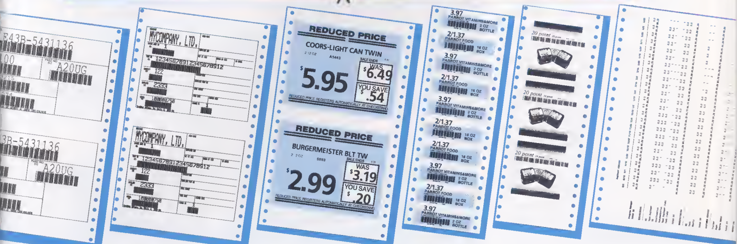

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CIRCLE 110 ON READER SERVICE CARD

INSIDE

For six years I've used *1-2-3* in its various incarnations. For six weeks I've used *1-2-3/G*, the graphical version that runs under OS/2 Presentation Manager. Compared with its predecessors, there's no question that *1-2-3/G* is more powerful. Part of its power comes from features originally found in *1-2-3* Release 3, as well as from features unique to *1-2-3/G*.

But the most pervasive and profound change that has been made to *1-2-3/G* is the new interface, which challenges the way I'm accustomed to working with *1-2-3*. From the perspective of someone proficient in using the DOS versions of *1-2-3* but who has only a touch of experience with graphical user interfaces (GUIs) and a mouse, what's it like to switch to *1-2-3/G*?

The answer is not straightforward–the changes are sweeping, ranging from variations in familiar commands to entirely new procedures for graphing. Perhaps the most effective way to convey the difference between *1-2-3/G* and prior releases is to document my experience in maneuvering through the graphical version. I'll concentrate on the basics of creating a spreadsheet and explore the new presentation-quality graph options and printing features. The "New Form, New Functions" box highlights some of the other new capabilities.

First Impressions

From the moment I double click the *1-2-3/G* icon on the desktop—the Presentation Manager window in which *1-2-3/G* appears—the changes are apparent. A logo appears on the screen, followed by a stylized version of the old, familiar spreadsheet, which occupies a window that doesn't fill the screen. This window is called the Worksheet Tool, one of two main tools composing *1-2-3/G* (the other is the Graph Tool). The Worksheet Tool, with some of the standard GUI elements of a *1-2-3/G* screen, is shown in figure 1.

As I expect from experience with GUIs, the usual complement of scroll bars and sizing icons appears in the window's borders. Using the mouse to click or drag the appropriate places in the borders, I can resize or move the window.

Also on-screen is a Help box and Desktop Control-menu box, which I can use to change the appearance of the *1-2-3* desktop, activate a window, adjust certain global settings, and access other utilities.

I immediately notice that *1-2-3/G*'s display is nearly devoid of icons for standard *1-2-3* tasks, such as erasing or formatting the currently highlighted range. For a

1-2-3/G

A veteran user observes what it's like to use the graphical version under OS/2 PM.

BY DANIEL GASTEIGER

mouse user, that means there are virtually no shortcuts to the features used most often. Fortunately, by selecting Utility User-Settings Preferences from the menu, I can display the function keys as icons. This more than makes up for the product's lack of a physical function-key template.

Unlike earlier releases of *1-2-3*, *1-2-3/G* displays the main menu throughout the work session. Moreover, there are new menu structures. In *1-2-3/G*, only the top-level menu selections appear at the top of the screen. A pull-down menu appears when I make a top-level menu selection that offers additional commands. If I choose a command from a pull-down menu and it leads to additional selections, these appear on cascade menus, which are displayed in stair-step fashion.

The obvious benefit to these new menu structures is that they display the full path of the command I've selected. In prior releases of *1-2-3*, pressing the Escape key repeatedly was the only way to retrace steps in a complicated menu selection.

To access the menus, I can press the slash key or use the mouse to click selections. I can opt for the cursor keys to navigate the worksheet as usual, or I can click cells to move the cell pointer in quick hops.

I also discover that by dragging the elevator in a scroll bar, I can display a distant area of the spreadsheet but leave the cell pointer behind. This might prove useful in large worksheets, as I'll be able to scroll around and view results of distant calculations without losing my place in the sheet. If I click a visible cell, the pointer jumps into view. If I press an Arrow key, the area that originally surrounded the cell pointer is displayed.

At this early point, it's clear that I face the choice: To GUI or not to GUI? So far, the key sequences I've used for the past six years still apply to my work in *1-2-3/G*. In fact, ignoring my mouse altogether, I can perform common tasks, such as inserting and deleting columns and rows, copying and moving data, and formatting ranges. But by forgoing the mouse, I may miss out on benefits that are unique to GUI environments. I decide to be flexible: Through trial and error I'll figure out when it's best to use the mouse and when I ought to revert to the keyboard.

Rediscovering the Basics

Before I get down to serious work, I enter the formula @DATE(90,7,1) in cell A1, press slash and select Range Format Date 1, and then press Return. Surprisingly, the formatted date, not a series of asterisks, appears in the cell. Apparently, *1-2-3/G* uses a smaller font than did previous releases. With other releases of *1-2-3*, a date formatted as DD-MMM-YY won't fit in a cell unless the column width is greater than nine characters.

I now want to erase the entry in cell A1 and then proceed with my worksheet. That calls for the Range Erase command, right? Wrong. There's a welcome alternative: a single-key erase. With the cell pointer in cell A1, I press the Delete key and the cell's entry vanishes!

My first step in setting up a worksheet is to use the Data Fill command to enter date serial numbers for the months of July, August, and September 1990. I click cell B1 to position the cell pointer and use the mouse to pull down the Data menu and to select Fill. A dialog box that blocks most of the spreadsheet appears.

The dialog box contains four text boxes in which I can enter the address of a range to fill, as well as start, step, and stop values. But two groups of option buttons compel me to reach for the mouse before I complete the command. The Series option buttons let me select the period that the step value represents. For example, clicking the Week button tells *1-2-3/G* to use weeks as the step value. Other options include minute, hour, weekday, quarter, and year.

I don't have to use the mouse to set these step intervals. But if I want to figure out the keyboard alternative, I need to read the documentation. There I discover that each Series option has its own code that I can enter along with the step value. For example, entering *1M* as the step value causes *1-2-3/G* to use a monthly increment when filling the target range.

The Order option buttons in the dialog box let me determine whether *1-2-3/G* fills the target range column by column or row by row. I can't quickly figure out how to select one of these options without resorting to the mouse.

ILLUSTRATIONS BY STEVE CARVER

But back to the Data Fill command. When I press the period key and the RightArrow key to highlight the range to fill, the dialog box is replaced by a small window that reveals the current range designation. I extend the highlight to indicate range B1..D1. When I press Return, the Data Fill dialog box reappears.

I enter the formula @DATE(90,7,1) as the start value, *1* as the step value, and *1,000,000* as the stop value. I don't press Return after typing the stop value because doing so would complete the Data Fill command. Instead, I grab the mouse, click the Month button, and then click OK. Three date serial numbers appear in the sheet as the dialog box vanishes.

To assign date formats, I click cell B1 and drag to cell D1—highlighting the range before I make a menu selection. Then I use the mouse to pull down the Range menu and select Format. The Range Format dialog box lists available cell formats. I click Date/Time, and a second box appears, offering the various date and time format options.

The dialog box also features a preview box that shows how a cell will look once I apply a selected format. So, for example, when I click the DD-Mon option, an example of that date format—in this case, 01-Jul—appears in the preview box. I double click DD/Mon/YY to get the standard format I've used in earlier releases of *1-2-3,* although this version has a more standard MMo/DD/YY option. The dialog box vanishes, and *1-2-3/G* applies the selected option to the specified range.

Beginning in cell A2, I enter several names in that column. A few of these spill over into column B. I automatically select /Worksheet Column Set-width before remembering that with a GUI, I can resize almost anything by dragging the appropriate display element. For example, I could have increased the column's width by dragging its right border in the worksheet frame.

Now, however, I face a dialog box that offers some nifty new options. For example, I can specify a column width in inches. Or I can let *1-2-3/G* assign a width that's large enough to accommodate the column's longest entry by clicking the Fit Largest button. I do so, and the names now neatly fit into column A.

After entering some sample data in range B2..D5, I create a dashed line in row 6. To do this, I first select a range by clicking cell B6 and dragging to cell D6. Then I type a backslash and an equal sign (\=), and instead of pressing Return, I hold down the Shift key and press Return. This key combination automatically copies the entry to each cell in the highlighted range.

This technique of specifying a range and then issuing a command takes some adjustment. I've grown accustomed in *1-2-3* to issuing a command and then specifying a cell or range. But with GUI products, you generally select an object, such as a cell or range, and then issue a command. As a hybrid of *1-2-3* and a GUI, *1-2-3/G* lets you use either syntax to issue commands.

To enter summary formulas in row 7, I enter the formula @SUM(B2..B5) in cell B7 and copy that cell to range C7..D7. Alternatively, I could have highlighted the range, typed the formula, and pressed Shift-Return. But for me, entering and then copying feels more natural.

Since I'm working with dollar amounts, I want to format ranges B2..D5 and B7..D7 for currency. To do this, I specify a "collection"—a group of two or more ranges that are in one or more sheets or active files. I use the right button on the mouse to drag from cell B2 to cell D5. Then I use the same button to drag from cell B7 to cell D7. When I click or drag cells with the right mouse button, previously selected cells remain selected. When I select /Range Format Currency, enter 0, and press Return, *1-2-3/G* formats the ranges. Building collections this way is a snap compared to building them by typing their addresses or using a series of keystrokes to specify them.

Although specifying a collection can speed my work when I use specific commands, it will challenge the way I work with named ranges. For example, I can copy a single cell entry to the cells of several ranges grouped as a named collection. However, when a collection includes ranges in several files, I can't assign the named collection as the From range in a Copy command.

Customize the Look

Having anticipated the spreadsheet-publishing features of *1-2-3/G*, I'm ready to put some of those new features to work on my basic spreadsheet. And here I discover a pitfall: Spreadsheet-publishing features are so powerful that I find it hard to stop fiddling.

First, with the cell pointer in row 1, I insert two rows and add the title *Third Quarter* in cell B1. With the mouse, I pull down the Range menu and select Attributes Font, which lets me assign fonts to characters in individual cells and ranges. The Range Attributes Font dialog box lists available fonts and font sizes. There are 20 fonts in all, which include Helvetica, Times Roman, Courier, and System Proportional and range in size from 8 to 24 points. A set of check boxes lets me select bold, italic, underlined, and strikeout attributes. A preview window shows how the currently selected font and attrib-

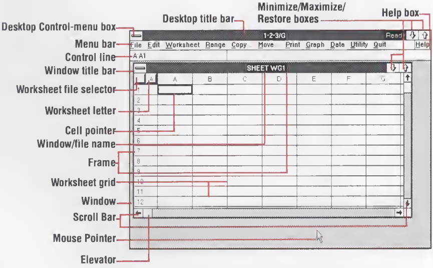


FIGURE 1. The appearance of *1-2-3* has been changed to fit the Presentation Manager environment.

utes will appear in the sheet. If I don't find a font size I like, I can click the Setup button and alter font sizes at will.

I'm happy with the 10-point Helvetica font, so I click it and then click the Bold check box. When I click OK, the dialog box vanishes, and the title in row 1 appears in bold, 10-point Helvetica. In addition, Row 1 itself automatically increases in height to accommodate the new font's size.

Now I'm curious. Will *1-2-3/G* let me manipulate the row heights myself? Yes. Even better, the new complement of row-height commands exceeds the old complement of column-width commands. The Worksheet Row dialog box offers options to hide and display rows, as well as to set the heights of several rows at once. I can resize a row by dragging the row's bottom border in the worksheet frame. Doing that, I discover that the enlarged *Third Quarter* title simply begins to disappear above the row's top border as I decrease the row's height.

The option Reset Height in the Worksheet Row dialog box sets the height to fit the largest font in the row. I click that option and then click OK to leave the row's height set to reveal the entire title.

I enhance the date headers in cells B3, C3, and D3 by selecting the range B3..D3 and changing to a 10-point Helvetica font that is bold and italic. Because of the altered font, the date entries no longer fit within the default column width. To widen all three columns at once, I select Worksheet Column and click the Fit-Largest button. By selecting a range of cells before issuing a command, I've been able to perform several operations on the range without having to respecify the range reference.

After a little more tinkering, I decide to add color shading to the range containing raw data. I highlight range B4..D7 and select Range Attributes Color. A dialog box containing a palette of colored tiles appears. I can specify combinations of background and text colors for all cells or for only those containing labels or positive or negative values within the selected range. These color options will come in handy when I need to customize screen displays in templates. Because I have a black-and-white printer, though, whatever colors I select for the screen will appear as shades of grey when printed. Therefore, I select a light grey for the highlighted range's background.

Finally, I select Range Attributes Border to put boxes around the entries in range B9..D9. The resulting dialog box offers three line styles: short dashes, long dashes, and solid lines. It also offers options for positioning the lines around and within the selected range. I put solid lines around all the cells in the range.

Compared with any spreadsheet I've created in prior releases of *1-2-3*, this one looks quite polished. The printout should be equally satisfying, but I want to explore graphing before I print the spreadsheet.

Some Graphic Play

1-2-3/G's new graph options let you create graphs that are truly stunning when compared with those created in earlier releases of the product. Added graph types include overlapped and 3-D bar graphs. You can combine several graph types in a single graph and plot data from multiple worksheets. After creating a graph, you can add lines and arrows and superimpose text anywhere on it. By directly manipulating individual graphic elements, you can resize and relocate elements and alter font types and styles.

While the Graph window is current, the Graph Tool menu replaces the Worksheet Tool menu on the display. The Graph Tool comes with its own manual, which I consider required reading. The graphing commands and options are split between the Worksheet and Graph Tool windows, and relying on intuition to find your way around the menus doesn't work. I searched the Graph Tool menu for some way to select another graph from among the graphs I'd named in the current worksheet. However, that command is in the Worksheet Tool menu. To get to it, I had to click on the worksheet to make it active and then select the command. Likewise, the method for assigning new or different data ranges to existing graphs isn't apparent from the Graph Tool menu.

Another twist is that a *1-2-3/G* graph can reside in a file separate from the worksheet that contains the data used to create it. Therefore, you can retrieve a graph that has no relationship to the worksheet currently in RAM. This can be disorienting if you're accustomed to thinking of graph and sheet as inextricable.

But how do I graph my data? And what does the graph look like in *1-2-3/G*?

With the cell pointer in cell B4, I select Graph View from the menu. *1-2-3/G*'s Quick Graph feature makes its best guess at what I want graphed, but the result isn't what I expected. The software tries to graph all the data surrounding the cell pointer and bounded by two contiguous blank rows or columns. The data I wanted graphed—range A3..D7—does not conform to this requirement. Before selecting Graph View, I should have designated a specific range of data. When I map out future models, I'll include the requisite two rows or columns between graph data and other worksheet structures.

To close the Graph window without saving it, I click the Window Control-menu box icon in the top-left corner of the Graph window, select Close, and click the No button. Then I highlight range A3..D7, pull down the Graph menu, and click Setup.

I click Bar within the dialog box, and select the Rowwise option, which tells *1-2-3/G* to use each row of the highlighted range as a data range. I make sure the boxes are marked that tell *1-2-3/G* to use the entries in the first row of the highlighted range as X-axis labels and to use the entries in the first column as the graph's legend. Now when I click OK, a bar graph complete with data legends and X-axis labels appears.

In creating the graph, *1-2-3/G* automatically displays the labels *Title, X Axis,* and *Y Axis* as generic titles. To improve the graph's message, I'll spruce them up a bit.

Each component of a graph—each bar, axis label, legend, element in a legend, and so on—is called a graph object. Using a mouse to modify the graph eliminates picking through menus to select and rearrange objects. I can simply click an object to select it and drag to reposition it. I click the label *Title.* To show that I've selected the title, small boxes called handles appear at each corner of the object. Because this is a text object, the title also

NEW FORM, NEW FUNCTIONS

There's far more to *1-2-3/G* than just a graphical facelift. Because it's an OS/2 application, *1-2-3/G* gives you multitasking (the ability to run two or more programs at the same time), as well as the ability to run standard DOS applications in OS/2's DOS compatibility box. And a number of features that were introduced in *1-2-3* Release 3 have been enhanced in *1-2-3/G.* These enhancements include three-dimensional worksheets and multiple windows in a sheet, as well as access to off-the-sheet databases.

Several features are unique to *1-2-3/G,* including Solver and Backsolver. Solver is what-if analysis at its best. Using this feature, you define a what-if scenario as a collection of constraint cells, a collection of adjustable cells, and an optimal cell. You might, for example, set limits on payroll, benefits, and variable expenses and let Solver adjust sales and production figures to produce the highest possible revenue for a given period. Solver manipulates the variable cells, maintaining whatever limits you've set on other cells, until it comes up with the target value.

The less complicated Backsolver utility will probably significantly reduce your reliance on the Data Table commands. Using this utility, you specify a target value for a formula and a variable to change to meet that goal. Backsolver works backward from the target value to determine the value needed to return the specified goal. I built a simple model that calculates the costs associated with the purchase and sale of three blocks of stock. Then I used Backsolver to determine what market value the stock should achieve to give me a target profit when I sell.

Also new in *1-2-3/G* is the Keystroke Editor, which is akin to Learn mode in earlier releases of *1-2-3.* During a *1-2-3/G* session, the Keystroke Editor records every keystroke you make, storing up to 16,384 characters before pushing out the earliest keystrokes to make room for the most recent ones. At any point, you can open a window that contains the keystrokes, which are recorded in macro-instruction format. You can edit the keystrokes, copy them to the worksheet so that you can name them as a macro, or select keystrokes within the editor to play back as a macro.

A macro-translation facility converts most macros created in *1-2-3* Releases 2.01, 2.2, and 3 into *1-2-3/G* macros. The process is fast and easy. You specify the name of the file containing macros to translate, the name of the file in which the translated macro will be stored, and if you wish, a file name for the report that lists the cell addresses and commands that *1-2-3/G* could not translate. Selecting the report option is critical because you'll then have a list of the lines of macro code you need to revise.

As a test of this feature, I translated the *1-2-3* check-register macro that ran in the June 1989 issue of *LOTUS* ("A New Check Register," page 37). Of the 155 lines of code, only 4 contained commands that *1-2-3/G* failed to translate. The translation report specified that the offending lines contained Print commands that *1-2-3/G* does not support. When I checked the translated macro, I discovered that *1-2-3/G* simply deleted from the code the Print commands that it could not translate.

Be prepared to tinker with a translated macro if the original contains certain Graph, File, or Print commands, specifies certain global worksheet defaults, or relies upon dynamic macro code. The *@Functions and Macros* book and the help screens for macro translation contain a list of the items that cannot be translated.

What is my recommendation for macro writers? Learn *1-2-3/G* well, and then rewrite your macros to take full advantage of the software's added functionality.

There's one other change to grapple with: The macro-activation key in *1-2-3/G* is the Control, not the Alt, key. To start a macro in *1-2-3/G,* you hold down the Control key and press the letter of the macro's name. This change was necessary because in Presentation Manager, the Alt key is reserved for certain menu shortcuts.

All these enhancements don't come without a price. Before I could even install the new *1-2-3,* I had to upgrade my system. *1-2-3/G* requires a minimum of 4 megabytes of RAM and 12.5 megabytes of free disk space. The documentation recommends at least 5 megabytes of RAM if you plan to do any multitasking. For optimal performance, Lotus recommends an 80386 system, but you can run the program, albeit sluggishly, on an 80286, as I did. I upgraded my 16-MHz, 80286 machine by adding a second 40-megabyte hard drive and an additional 6 megabytes of RAM for a total of 7 megabytes. And I made one other addition to my system: a mouse. Navigating windows and commands without one is too labor intensive.

—D.G.

appears in the contents box at the top of the display. When I type a new title, *Eastern Division*, and press Return, it replaces the generic title in the Graph window. The title remains selected and I can continue to modify it by altering its font, color, or location. I select Settings Font and choose 18-point Times Roman for the graph title. Then I use similar procedures to modify the axis titles.

I've already exercised one option from the Graph Tool menu, but I notice another that's quite intriguing: Graph Type Gallery. This is a powerful feature. Simply by clicking, I get access to a wide variety of graphs. I can also examine the effects of combining several of the settings that were available only via menus in earlier releases of *1-2-3*.

I first select Type Gallery, and a window displays several variations on the bar-graph theme. I click a graph image that shows the legend in a box below the graph, rather than next to it, and I click the Apply button. My underlying graph temporarily assumes this new configuration, and I drag the overlying dialog box to one side for a better view.

The change to my graph won't be permanent unless I click OK. Clicking Cancel closes the dialog box and retains the original graph. While I'm here, I click several of the graph types in the list box. I apply some of the options without committing my graph to the selected look.

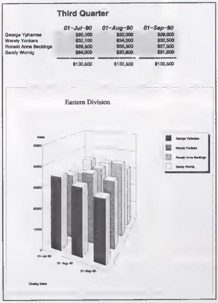
Eventually, I click 3-D Bar, click one of the images, and then click the Apply button. The resulting 3-D bar graph is snazzy, but it provides no more information than that of an overlapping bar graph. Z-axis labels don't appear automatically on the third axis–I would add them one by one if the information didn't already appear in the graph legend. When I click OK, the dialog box vanishes and my 3-D graph dominates the display.

Changing graph types has caused the X-axis title to become jumbled with the X-axis labels. I drag the title a little to the left to clean up the mess. I also drag the legend box to the right to separate it a bit from the graph image. I'm ready to print.

What I Saw Is What I Got, Eventually

The printing features in *1-2-3/G* are much better than those of other releases of *1-2-3*. As a GUI environment, *1-2-3/G* is WYSIWYG (what you see is what you get). The enhancements to a spreadsheet print out as they appear on the display.

However, achieving the output you want can be trying. For example, an advantage of *1-2-3/G* is that you are able to print graphs along with spreadsheet ranges without resorting to a separate PrintGraph program. But combining spreadsheet ranges and graphs is an involved procedure. With *Allways* and with *Impress* (PC Publishing), you can place graphs in the spreadsheet and then print worksheet ranges that include the graphs. In *1-2-3/G* you must print ranges and graphs to a preview window and then print that window.



Third Quarter

	01-Jul-90	01-Aug-90	01-Sep-90
George Yphantes	$35,000	$32,000	$29,000
Wendy Yonkers	$32,100	$34,500	$32,500
Ronald Anne Beckinge	$29,500	$33,500	$37,500
Sandy Wornig	$34,000	$33,800	$31,600
	$130,500	$133,500	$130,500

FIGURE 2. The printed output of my tour of *1-2-3/G*

To start this procedure, I click the worksheet to make its window current and then select Print Printer. I select range A1..D9 as the range to print. Then I click the Screen Preview box to send the printed ouput to the preview window. I also click the box that controls whether grid lines and borders will be printed along with the spreadsheet range. By default, *1-2-3/G* prints these, and clicking the box eliminates them from my output. I click Go and then Quit. After a long wait, the preview window appears and displays an image of the worksheet range on a mock-up of a printed page.

I have to switch back to the Graph window to print the graph. I click that window and from the File menu, select Print Print-Graph. I could let *1-2-3/G* select both the graph's sizing and placement. Instead, I enter values to size the graph five inches square and then decide to let *1-2-3/G* position the graph automatically. I click the Screen Preview box and then click Print. The graph image eventually appears on the preview page beneath the spreadsheet image. The graph falls immediately beneath the worksheet range, and the preview page looks cramped. Being fussy, I select Undo from the Edit menu to reverse my last command. Undoing the command removes the graph from the page. I can reposition the graph by entering a vertical offset, but the offset represents a distance in inches from the top of the page. I'm not sure how many inches the original spreadsheet range subsumes, so I opt for a different method of positioning the graph. I switch back to the Sheet window, reactivate the Print dialog box, and click the Line button three times to insert three blank lines between the sheet and graph. Then I switch to the Graph window and reissue commands to print the graph. This time the graph image appears several lines below the printed worksheet range. Satisfied with the preview page, I pull down the preview window's Print menu, and click Printer. The printout that emerged from my laser printer appears in figure 2.

A Few Afterthoughts

My tour of *1-2-3/G* completed, I'll summarize my advice to those of you who are considering making the switch. First, if you're a veteran *1-2-3* user, rely on what you already know. You'll feel right at home with about 80% of the product, and tapping out the first letter of old, familiar commands works much of the time. Second, when a dialog box pops up, take the time to read it. There you'll find new options neatly summarized in one place. Third, count on the documentation for help with the Graph Tool. Fourth, and possibly most important, have some fun playing with the product. You'll probably find that parts of *1-2-3/G*–especially the spreadsheet-publishing features–are addictive. ■

Daniel Gasteiger is a *1-2-3* and *Symphony* consultant in Boston and a contributing editor to *LOTUS*.

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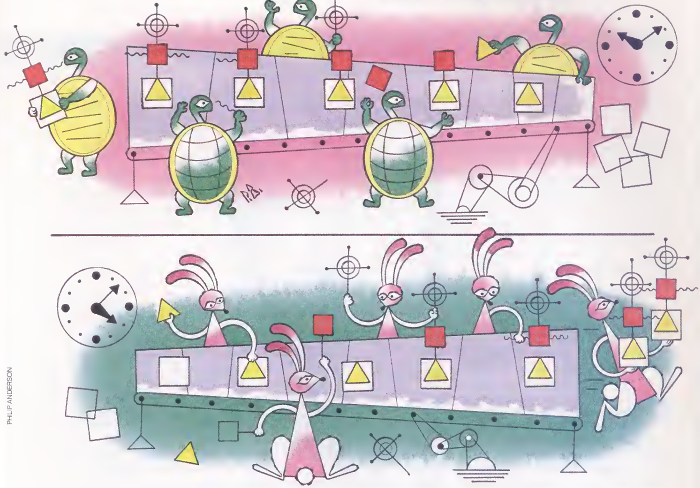


PHILIP ANDERSON

How Long is the Job Going to Take?

The learning-curve model estimates the time required for a manufacturing process.

BY RICHARD L. LUEBBE AND BYRON J. FINCH

Manufacturers who develop new products or do custom work for other companies need to know how long the production process will take. The problem is that the time required to build the first 100 units of a product does not reveal the time that will be required to build the next 9,900 units. That's because the production pace increases as the workers gain experience.

Fortunately, a mathematical model can estimate the duration of a manufacturing run. It's called the learning-curve model, and it translates nicely to the spreadsheet. The spreadsheet model, which works in *1-2-3* Releases 2.01 and higher and in *Symphony*, solves a variety of learning-curve problems.

The aircraft industry has been using the concept of a learning curve since its earliest days. The concept has been applied in many other learning situations. Today, manufacturers routinely use learning curves to estimate the time required for product design and production.

Learning curves also play a role in strategic decisions, such as pricing, capital investments, and operating costs for new facilities or processes. And they're used in conjunction with process improvement. Many manufacturers are exploring or exploiting the just-in-time (JIT) philosophy and synchronous manufacturing. Both approaches depend on rapid retooling of assembly lines, so correctly predicting improvement in retooling time is important.

The fundamental idea behind learning-curve analysis is that the time required to produce each successive item in a series will diminish according to a predictable pattern. For a given improvement rate *i*, you can compute the length of time *L* to produce the *n*th item with the following equation:

$$L_n = L_1 n^{\frac{\ln(i)}{\ln(2)}}$$

In the equation, L_1 is the time needed to produce the first item in the series.

For example, suppose that the time required to produce the first unit is 16 hours and the learning-curve rate is .8. First, find the value of the exponent by dividing the natural logarithm of .8 by the natural logarithm of 2. This result is -.322. The estimated time required to produce the 10th unit will be $16 \times 10^{-.322}$, or 7.62, hours. The time required to produce the 100th unit will be $16 \times 100^{-.322}$, or 3.63, hours.

Applying the Concept

One of the more common applications of learning-curve theory is the bid-preparation process. Normally, the goal of this process is to estimate the total cost of a project. Cost depends on many related factors, including project length, direct-labor rates, and administrative and overhead rates. Using the formula above, you can compute project length. Then, knowing the labor and overhead rates, you can easily compute total project cost.

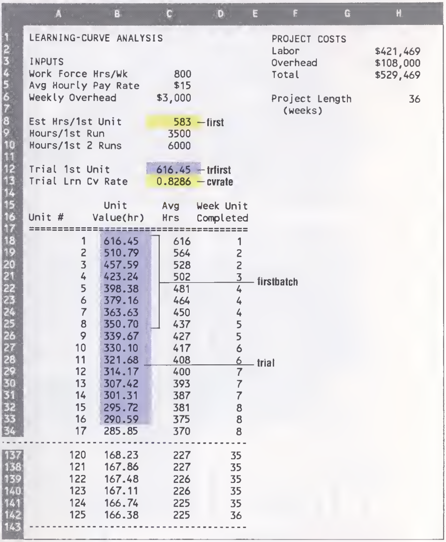
It is possible, however, that you don't know the time needed to produce even one unit, or the learning rate, or both. In some cases, these values can be estimated from experience. But estimating either one without support data is risky. A small error in either parameter can produce large errors in predicting costs and the project-completion date.

A common way to minimize such bidding risk is to undertake several small, exploratory production runs. The prospective bidder then uses the times required for each run as a basis for estimating the learning-curve rate for the time required to produce the first item.

Here's how the process works: Assume that each of the first two trial runs produces 8 units. Use the *n*th-unit formula to compute times for units 1 to 16, using a trial learning-curve rate and any nonzero value for the first unit. Sum the times for the first 8 units and for all 16 units. Compare the ratio of those two values to the same ratio based on the actual trial runs. Then try different learning-curve rates until you find the one for which the predicted ratio is equal to (or nearly equal to) the trial-run ratio.

Once you arrive at the appropriate learning rate, use a similar trial-and-error approach to find the correct value for L_1, the time needed to produce the first unit. The correct first-unit time is the one for which the computed time required to complete the first eight units equals (or nearly equals) the actual time required to complete the first trial run of eight units.

For example, suppose that Exmoor, a small manufacturing firm, plans to sub-



```
        A          B          C          D    E        F          G          H
  1  LEARNING-CURVE ANALYSIS                      PROJECT COSTS
  2                                               Labor                 $421,469
  3  INPUTS                                       Overhead              $108,000
  4  Work Force Hrs/Wk           800              Total                 $529,469
  5  Avg Hourly Pay Rate         $15
  6  Weekly Overhead          $3,000              Project Length              36
  7                                                 (weeks)
  8  Est Hrs/1st Unit            583 —first
  9  Hours/1st Run              3500
 10  Hours/1st 2 Runs           6000
 11
 12  Trial 1st Unit           616.45 —trfirst
 13  Trial Lrn Cv Rate        0.8286 —cvrate
 14
 15                Unit       Avg   Week Unit
 16  Unit #     Value(hr)     Hrs   Completed
 17  ====================================
 18          1   616.45  ┐    616          1
 19          2   510.79  │    564          2
 20          3   457.59  │    528          2
 21          4   423.24  ├────502──────────3── firstbatch
 22          5   398.38  │    481          4
 23          6   379.16  │    464          4
 24          7   363.63  │    450          4
 25          8   350.70  ┘    437          5
 26          9   339.67       427          5
 27         10   330.10       417          6
 28         11   321.68 ──────408──────────6── trial
 29         12   314.17       400          7
 30         13   307.42       393          7
 31         14   301.31       387          7
 32         15   295.72       381          8
 33         16   290.59       375          8
 34         17   285.85       370          8
 ------------------------------------------
137        120   168.23       227         35
138        121   167.86       227         35
139        122   167.48       226         35
140        123   167.11       226         35
141        124   166.74       225         35
142        125   166.38       225         36
143  ------------------------------------
```

FIGURE 1. This section of the worksheet produces a table that shows the time required to produce each item in a 125-unit production run, along with a running average of unit-completion time and the number of the week in which each unit is completed. To use it, enter the six values in range C4..C10. A macro determines the appropriate values for cells C12 and C13, and these values control the results in range B18..D142. Formulas in column H determine the costs for the entire project.

mit a bid to produce 125 widgets for another company. Exmoor produces a prototype widget, then completes two production runs of eight units each. The first run took 3,500 hours, the second, 2,500 hours. The company plans to assign 20 workers–a total of 800 person-hours per week–to the project. Administrative and other overhead costs are expected to be $3,000 per week. Exmoor's management wants to know project cost, project duration, and an approximate delivery schedule. It also wants to know how sensitive those numbers are to variations in the learning-curve rate.

Figure 1 shows a spreadsheet that computes these values. Note that about 100 rows are omitted to save space.

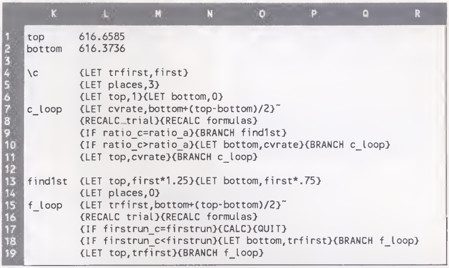
Rows 4 through 6 of column C contain values pertaining to the environment in which the work will be done: work force hours per week, the average hourly pay, and the weekly overhead cost. Rows 8 through 10 contain values pertaining to the work itself: a ballpark estimate of the time required to complete the first unit, the actual time required to complete the first trial run of eight units, and the actual time required to complete the first two trial runs totaling sixteen units.

The estimated first-unit time in cell C8 helps the worksheet home in on the correct first-unit time. If you're not sure what to enter here, you can make a reasonable guess by dividing the time for the first eight-unit trial run (cell C9) by 6, as we have done here.

Cells C12 and C13 contain the first-unit time and the learning-curve rate. The worksheet calculates the values for these cells. You'll see how this works later.

Rows 18 to 142 make up a table that shows the time required to complete each unit, the cumulative average number of hours to complete units, and the week in which each unit is completed. The formula in cell B18 rounds the value in cell C12 to two decimal places. The remaining formulas in column B are equivalent to the *n*th-unit formula presented earlier. They use the value in cell B18 for L_1 and the value in cell C13, rounded to four decimal places, for i.

Before examining how the worksheet arrives at the appropriate first-unit time and learning rate, build the worksheet from the instructions in the setup box. These instructions direct you to enter 1s in cells C12 and C13. When you've finished, all the formulas in range B18..D142 will return the value 1.



```
        K         L         M         N         O         P         Q         R
 1  top       616.6585
 2  bottom    616.3736
 3
 4  \c        {LET trfirst,first}
 5            {LET places,3}
 6            {LET top,1}{LET bottom,0}
 7  c_loop    {LET cvrate,bottom+(top-bottom)/2}~
 8            {RECALC_trial}{RECALC formulas}
 9            {IF ratio_c=ratio_a}{BRANCH find1st}
10            {IF ratio_c>ratio_a}{LET bottom,cvrate}{BRANCH c_loop}
11            {LET top,cvrate}{BRANCH c_loop}
12
13  find1st   {LET top,first*1.25}{LET bottom,first*.75}
14            {LET places,0}
15  f_loop    {LET trfirst,bottom+(top-bottom)/2}~
16            {RECALC trial}{RECALC formulas}
17            {IF firstrun_c=firstrun}{CALC}{QUIT}
18            {IF firstrun_c<firstrun}{LET bottom,trfirst}{BRANCH f_loop}
19            {LET top,trfirst}{BRANCH f_loop}
```

FIGURE 2. This macro uses two loops to determine the appropriate values for the time required to produce the first unit and the learning-curve rate

An Iterative Macro

The worksheet uses a macro that "backs into" the correct values for first-unit time and learning rate. The macro, which appears in figure 2, establishes a range by assigning a top value and a bottom value, then makes a guess that's midway between the two. If the guess is too low, the macro narrows the range by making the guess the new bottom value. If the guess is too high, the macro makes the guess the new top value. Then the macro repeats the process, using new, progressively smaller ranges, until it arrives at the correct value.

Here's how the *\c* macro works:

{LET trfirst,first} assigns the value in the cell named *first* (cell C8) to the cell named *trfirst* (for "trial first," cell C12).

{LET places,3} sets the value of *places* (cell T1, figure 3) to 3. We'll look at this in detail in a moment.

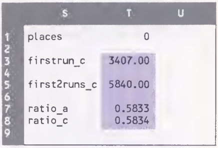
{LET top,1}{LET bottom,0} sets the value of *top* (cell L1) to 1 and sets *bottom* (cell L2) to 0.

{LET cvrate, bottom+ (top-bottom)/2}~ sets the value of *cvrate* (cell C13) to the value that's halfway between *top* and *bottom*.

{RECALC trial}{RECALC formulas} updates the formulas in the ranges *trial* and *formulas*. *Trial* includes the first 16 rows of the column of *n*th-unit formulas in column B. *Formulas* includes the formulas in range T3..T8, shown in figure 3.

{IF ratio_c=ratio_a} compares the formulas in *ratio_c* (for "computed" ratio, cell T8, figure 3) to *ratio_a* (for "actual" ratio, cell T7). If these two cells return equal values, the macro has found the correct learning-curve rate and executes the instruction **{BRANCH findlst}**. Note that the formulas in *ratio_c* and *ratio_a* round their results to the number of places in *places*, which was set to 3 by the instruction in cell L5.

{IF ratio_c>ratio_a} determines if the macro's guess is too low. If this condition is met, the macro executes the commands **{LET bottom,cvrate}** and **{BRANCH c_loop}**, thereby setting the value of *bottom* to the current value of *cvrate* and branching back to the cell named *c_loop* (cell L7). That causes the macro to make a new guess.



```
        S               T         U
 1  places                  0
 2
 3  firstrun_c       3407.00
 4
 5  first2runs_c     5840.00
 6
 7  ratio_a           0.5833
 8  ratio_c           0.5834
 9
```

FIGURE 3. The macro uses formulas in this range to produce values used in comparing predicted versus trial experience

If *ratio_c* is neither equal to nor greater than *ratio_a*, then it must be less than *ratio_a*. In that case, the instruction in cell L11, {LET **top**, **cvrate**}, sets the value of *top* to the current value of *cvrate*, and the macro branches back to *c_loop*.

Stated more simply, the \c routine continues in a loop, adjusting the value of either *bottom* or *top*, until it homes in on the value for *cvrate* that satisfies the {IF} test in cell L9. Then the routine passes control to the *find1st* routine.

Find1st begins with {**LET top,first*1.25**} and {**LET bottom,first*.75**}, which set *top* and *bottom* to values that are 25% higher and 25% lower than the estimate you entered in cell C8.

{**LET places,0**} sets the value of *places* to 0 instead of 3. Less precision is required here, and setting *places* to 0 means that the *find1st* routine will finish much faster.

{**LET trfirst,bottom+(top-bottom)/2**}~ puts a guess at first-unit time in cell *trfirst*.

{**RECALC trial**}{**RECALC formulas**} updates the results in *trial* and *formulas*.

{**IF firstrun_c=firstrun**} tests to see if *firstrun_c* (cell T3, which computes the sum of the first eight calculated times) is equal to cell *firstrun*, the actual time needed to complete the first trial run of eight units. If these cells are equal, the macro recalculates the worksheet and ends.

{**IF firstrun_c<firstrun**} determines if the macro's guess is too low. If this condition is met, the macro executes the commands {**LET bottom,trfirst**} and {**BRANCH f_loop**}. If the {IF} tests in both cells L17 and L18 fail, the macro executes the instructions {**LET top, trfirst**} and {**BRANCH f_loop**} in cell L19. This looping continues until the routine finds the values that satisfy the test in cell L17.

To run the macro, press the Home key, then hold down the MACRO key (Alt on most computers) and press C. Watch cell C13, and you'll see the macro try different values there until it gets to 0.8286. Then watch cell C12, and you'll see the macro try different values until it gets to 616.45. Finally, the macro recalculates the entire sheet, which takes a few seconds.

The macro has determined that the learning-curve rate will be .8286 and that the expected first-unit time is 616.45 hours. By looking down column B, you can see that the time to produce the 10th unit will be 330.10 hours, the time to produce the 120th unit will be 168.23 hours, and the time to produce the 125th and last unit will be 166.38 hours. Note, too, the value in cell C142. It shows that the average production time per unit will be 225 hours, compared to a first-unit time of 616 hours.

Learning-Curve Rate	Time 1st Unit	Project Duration *(in weeks)*	Labor Cost	Overhead Cost	Project Cost
0.8286	616.45	36	$421,469	$108,000	$529,469
0.8000	616.45	30	$352,422	$90,000	$442,422
0.8500	616.45	41	$480,931	$123,000	$603,931
0 8286	600.00	35	$410,222	$105,000	$515,222
0.8286	630.00	36	$430,733	$108,000	$538,733
0.8500	630.00	41	$491,503	$123,000	$614,503
0.8000	600.00	29	$343,018	$87,000	$430,018

FIGURE 4. Different combinations of numbers in the first two columns produce the results in the remaining four columns.

Column D indicates that only the first unit will be completed during the first week. The second and third units will be completed during the second week, and the fourth unit will be completed during the third week. After that, at least two units will be completed each week. The last unit will be completed in week 36.

Range F1..H7 makes up a small table that details the costs of the project, given the assumptions in cells C12 and C13. Cell H6 returns the length of the project by determining the highest value in range D18..D143. The formula includes cell D143 in its range to allow you to add rows to the worksheet later. Cell H2 computes the labor cost for the project by multiplying the hourly wage in cell C5 by the sum of the individual production times. Cell H3 computes the overhead for the project by multiplying the weekly overhead amount in cell C6 by the project duration in cell H6. Cell H4 computes the total cost by adding cells H2 and H3.

What-If Analysis

The values that the macro has placed in cells C12 and C13 probably do not accurately predict the first-unit time and the learning-curve rate. They are merely plausible values based on experience with the trial runs. In practice, the time needed to build the first unit could be substantially higher or lower than the time that appears in cell C12. The same goes for the learning-curve rate in cell C13.

Note that the first-unit time that the model produces is for the first unit produced *after* the trial runs. It assumes that some experience was gained in producing the trial-run units.

To develop an informed bid, perform some sensitivity analyses. Enter different values in cells C12 and C13 and, for each set of values, recalculate the worksheet with an eye on column H. For example, if you enter *600* in cell C12 and press the CALC key, the duration of the project (cell H6) drops to 35 weeks, labor costs drop to $410,222, overhead costs drop to $105,000, and total costs drop to $515,222. The table in figure 4 shows the results of using a few different combinations of first-unit times and learning-curve rates.

Modifying the Worksheet

To change the number of units that will be built during the project, delete or insert worksheet rows. For example, if the bid is for a run of 100 units, delete rows 118 to 142. Be careful not to delete the row containing the dashes; doing so will corrupt formulas. If the bid is for a run of 200 units, insert 75 new worksheet rows between rows 142 and 143. Use the Data Fill (in *Symphony*, Range Fill) command to enter the numbers 126 to 200 in range A143..A217. Then copy the formulas in range B142..D142 to range B143..B217.

If the trial runs are for a number of units other than eight, change the sizes of the ranges *firstbatch* and *trial*. *Firstbatch* should include the number of units produced in the first run. *Trial* should include the number of units produced in two trial runs. For example, if the trial runs produce 10 units each, *firstbatch* should include the first 10 *n*th-unit formulas, range B18..B27. *Trial* should include the first 20 formulas, range B18..B37. Changing these ranges adjusts the formulas in cells T3 and T5.

Once the worksheet is modified, enter the appropriate values in range C4..C10, then start the macro by pressing MACRO-C. When the macro finishes, there will be plausible values for the time to complete the first unit and the learning-curve rate in cells C12 and C13.

This model provides a macro-based approach to finding appropriate values for the trial first-unit time and the trial learning-curve rate, cells C12 and C13, respectively. Readers who own the *1-2-3* add-in *What-If Solver* (Frontline Systems, Palo Alto, Calif.) may prefer to use that product to solve learning-curve problems. Similarly, *1-2-3/G* users may find that the Solver feature in that version allows for more-elegant solutions. ■

Richard L. Luebbe and Byron J. Finch are associate professors in the Department of Management at Miami University in Oxford, Ohio.

The model in this article can be downloaded from CompuServe. For more information, see the box on page 4.

HOW TO SET UP THE LEARNING-CURVE WORKSHEET

1. Releases

This model runs in *1-2-3* Releases 2.01, 2.2, and 3 and in *Symphony* Releases 2.0 and 2.2.

2. Default settings

Recalculaton: Manual

1-2-3: /Worksheet Global Recalculation Manual
Symph MENU Settings Recalculation Method Manual Quit

Format: Fixed 0

1-2-3: /Worksheet Global Format Fixed, enter *0*
Symph: MENU Settings Format Fixed, enter *0*, select Quit

3. Column widths

Column	***Width***
A	11
E	4
S	13

For example, to set the width of column A, position the cell pointer in column A and select

1-2-3: /Worksheet Column Set-Width, enter *11*
Symph:MENU Width Set, enter *11*

4. Cell formats

Format	***Range***
Currency 0	C5..C6, H2 .H4
Fixed 2	C12, B18 .B142
Fixed 4	C13
General	T3..T8

For example, to set the format of range C5..C6, select

1-2-3· /Range Format Currency, enter *0*, specify range C5..C6
Symph· MENU Format Currency, enter *0*, specify range C5 .C6

5. Labels

Enter the labels shown in column A of figure 1. Enter the labels shown in range B15..D16, and center the labels: Select /Range Label Center (*Symph:* MENU Range Label-Alignment Center) and specify range B15..D16. Enter a backslash and an equal sign (\ =) in cell A17, and copy cell A17 to range B17..D17. Enter the labels shown in column F of figure 1. Precede the label in cell F7 with a caret (^).

Enter \- in cell A143 and copy cell A143 to range B143 D143

Enter the labels shown in column K of figure 2. Precede the label in cell K4 with an apostrophe. Then enter the labels in range L4..L19 and in column S of figure 3.

6. Values

Enter the values shown in range C4..C10 of figure 1. Enter *1*s in cells C12 and C13. Enter the numbers *1* to *125* in range A18..A142: Select /Data Fill (*Symph*: MENU Range Fill), specify range A18..A142, enter *1* as the start value, and press Return twice to accept the default step and stop values.

7. Range names

Name	***Address***
top	L1
bottom	L2
\c	L4
c_loop	L7
find1st	L13
f_loop	L15
places	T1
firstrun_c	T3
first2runs_c	T5
ratio_a	T7
ratio_c	T8

Assign the preceding range names, using the labels in columns L and S: Press slash (*Symph*: MENU), select Range Name Labels Right, and specify range K1..K15. Then press slash (*Symph*: MENU), select Range Name Labels Right, and specify range S1..S8.

Assign the following range names individually:

Name	***Range***
first	C8
firstrun	C9
first2runs	C10
trfirst	C12
cvrate	C13
firstbatch	B18. B25
trial	B18. B33
formulas	T3..T8

For example, to assign the name *first* to cell C8, press slash (*Symph*: MENU), select Range Name Create, enter *first*, and specify cell C8.

8. Formulas

Cell	***Formula***
B18	@ROUND(trfirst,2)
B19	+$B$18*A19^(@LN(@ROUND ($cvrate,4))/@LN(2))

Copy cell B19 to range B20..B142.

Cell	***Formula***
C18	@AVG(B$18..B18)
D18	@ROUND(@SUM(B$18..B18)/ C$4+0.499,0)

Copy range C18..D18 to range C19 .C142

Cell	***Formula***
H2	+C5*@SUM(B18..B143)
H3	+C6*H6
H4	+H2+H3
H6	@MAX(D18..D143)
T3	@ROUND(@SUM(firstbatch),places)
T5	@ROUND(@SUM(trial),places)
T7	@RDUND(firstrun/first2runs,4)
T8	@ROUND(firstrun_c/first2runs_c,4)

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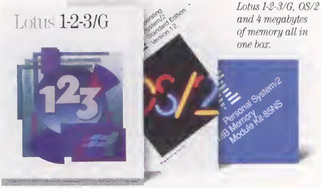
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If you're a current 1-2-3 user, you'll be happy to know that all data and macros created in existing versions of 1-2-3 can be retrieved directly into 1-2-3/G. So a move to OS/2 will only serve to enhance any investment you may have already made in 1-2-3.

IBM

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With OS/2, 1-2-3/G can give you Dynamic Data Exchange. DDE provides live links to other Presentation Manager™ applications for true application integration.

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THE 1-2-3 CAREER PATH

How four programmers parlayed their skills into big bucks

BY ANDREW MAYKUTH

About 10 years ago, John Shepard was a ski bum in Montana. Then the restaurant where he tended bar began time-sharing a computer. Shepard, who had done "a little light programming" in college, took a stab at creating a payroll system for the restaurant. Within a few keystrokes, he decided that writing code was more fun than serving drinks.

Nowadays, the 34-year-old Shepard charges $125 an hour to write custom applications in *1-2-3*. "Your earnings potential is limited only by your ability to sell your services," he says.

Shepard is just one of many computer users who have translated a proficiency in writing *1-2-3* applications into a new career. For example, Jeffrey L. Pulver, now 27, developed such useful applications while working at a Long Island accounting firm that he formed his own company, Spreadsheet Solutions, to market them as commercial *1-2-3* add-ins. Dan Trznadel, 26, is a CPA and senior tax associate at the mammoth accounting firm Arthur Andersen & Co. He is also one of the chief authors of the tax-calculation templates used in more than 100 Arthur Andersen offices nationwide.

For John Shepard, writing computer code was more fun and more profitable than tending bar

CHERYL SHEPARD

On-the-job education

How did these and other *1-2-3* experts do it? There seems to be no standard route to success. But most successful programmers are young, driven, and self-taught. Few of them set out to become software specialists. Shepard, for example, majored in economics in college, with an emphasis on international development. "That certainly helps when you are writing code every day," he jokes.

Most learned *1-2-3* on the job. D. Scott Stephens, 23, who graduated from col-

Dan Trznadel took a job with Arthur Andersen specifically to develop computer expertise.

BASKAD PHOTOGRAPHICS

lege two years ago with a degree in systems analysis, learned *1-2-3* last year at NCR Corp. in Dayton, Ohio. Stephens had never written a macro in his life when his boss handed him a copy of *1-2-3* Release 3 and the Lotus Add-In Toolkit for Release 3. About four months later, Stephens had completed the sophisticated profit-planning model now used at NCR offices worldwide to project the profitability of new products.

The experience taught Stephens firsthand what software developers say is the one universal truth of their business: Good programmers must understand the world for which they write applications. "We want people who understand the business application, as well as how to make *1-2-3* work," agrees John E. Haner, a partner at Arthur Andersen and manager of Trznadel and nine other *1-2-3* specialists. "We look for people with both accounting and computer skills."

More than writing macros

Employers and consultants emphasize that an applications developer needs far more sophisticated skills than an ace macro writer. Many consultants advertise themselves as *1-2-3* experts, but true applications developers are less common.

"Developing an application isn't necessarily intuitive, and the *1-2-3* documentation doesn't tell you how to do it," says Brian Murphy, a former financial planner. Murphy is now manager of Lotus Applications Services at the New York office of Lotus Development Corp., a branch that provides consulting services to large *1-2-3* customers. "It really comes from hours and hours of playing with the code. And if you're in another job, you're doing it on your own time."

"It's all self-taught," agrees Shepard, who spent some time at Lotus's San Francisco office as an applications developer. A little over a year ago, Lotus phased out its San Francisco applications-services office, so Shepard formed Sierra Data Consulting, which he runs out of his house in Belmont, Calif. His first two customers were former Lotus clients.

Scott Stephens learned *1-2-3* on the job, as he created NCR Corp.'s profit-planning model.

HAND COLORING BY JEAN BAILEY

Jeffrey Pulver formed a company to market the applications he wrote for his last employer.

Like Shepard, Jeffrey Pulver used his relationship with his employer as a springboard to another business. Pulver had done a fair amount of free-lance programming, in high school and college, by the time Margolin, Winer & Evens CPAs, a Garden City, N.Y., accounting firm, hired him in 1984. The following year, as head of a small group of programmers, he persuaded the firm to offer computer services to its clients.

"I started realizing that I had some expertise in problem solving," he says. So in late 1987 he formed Spreadsheet Solutions. But rather than divorce himself from his employer, Pulver invited the firm to provide venture capital for Spreadsheet Solutions. "Not only did we not want to lose his far-flung abilities," says Paul Silpe, the managing partner in the accounting firm, "but we also saw an opportunity to broaden our revenue base."

Several products–*FinCalc*, *@Ease*, and *@Fixed_Income*–grew out of Spreadsheet Solutions' work for private clients at brokerage houses and financial institutions. In addition to providing the commercial packages, Spreadsheet Solutions' nine full-time employees do custom work ranging from single @functions to full-scale templates. "People on Wall Street are willing to pay a premium for the right tools," Pulver says, "which makes this a low volume, high-profit area."

Inside jobs

But some companies rarely hire free-lance programmers. Arthur Andersen, for example, has established a 60-person applications-development group at its Chicago headquarters. The group is responsible for creating software for and supporting microcomputer use in the firm's U.S. tax practice. Its flagship product is a five-year tax planner for individuals. "We learned to be very efficient in our use of memory," says Trznadel, "because the spreadsheet grew into about a 1-meg monster." Arthur Andersen chose to write the application in *1-2-3*, he says, so that it could be easily updated to reflect changes in the tax law.

PROGRAMMERS MUST UNDERSTAND THE WORLD FOR WHICH THEY WRITE APPLICATIONS.

The need for constant updating was also the reason NCR Corp. decided to redo its profit-planning model in *1-2-3*. "They wanted an information system, not just a template," says Stephens.

"Financial programs often take a long time to develop and are expensive to maintain when done the traditional way," says William Hahn, NCR's director of program financial management. "But this kind of product allows us to develop some pretty sophisticated applications without hiring an outside staff."

Stephens, meanwhile, has decided to return to school for a master's degree in business administration. He hopes eventually to have an opportunity to use his business and programming skills in his own business. "To establish yourself, you need a good background, good credentials, and good contacts," he says. "Right now, I think I need more experience."

Andrew Maykuth is a veteran newspaper writer who lives and works in New York.

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MARK STEELE

COMMODITY PRODUCERS AND CONSUMERS USE THE COMMODITIES MARKETS TO LOCK IN PRICES, TRANSFERRING THEIR PRICE RISK TO SPECULATORS.

HOGS, BEANS, AND SPREADSHEETS

Three popular techniques for timing investments in stocks and commodities

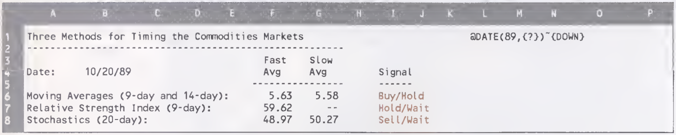
BY ANIL GULATI

The prospect of making a fast buck has always lured speculators to commodities trading. Commodity producers and consumers use the commodities markets to lock in prices, transferring their price risk to speculators. The speculators assume the price risk in the expectation of quick and hefty rewards—if and when dramatic price swings occur.

But hand in hand with this potential for gain goes the risk of losing large sums of money in a relatively short period of time. Industry statistics show that 90% of small investors who trade in commodities lose money, often their entire trading accounts. The volatility of the commodities markets makes them especially hard to predict, and amateur speculators are easily confused by the pauses and retracements within a larger upward or downward price trend.

A few-cent drop in the price of a commodity may mean a huge loss for a speculator holding contracts to buy that commodity. The buyer of a contract agrees to purchase a fixed amount of a commodity from the seller. In the soybean market, for example, each contract covers 5,000 bushels of soybeans. Suppose that the price of soybeans drops 10 cents in a single day's trading. At the end of the day, accounts are "marked to the market." That is, accounts that are long (holding contracts to buy soybeans) are debited $500 per contract, and accounts that are short (holding contracts to sell soybeans) are credited $500 per contract. A speculator holding 100 contracts to buy soybeans would suffer a $50,000 loss in his or her account. If the account does not have enough funds to cover the day's losses, the speculator must add funds, or the account will be liquidated the next trading day. This practice ensures fair and smooth operations of the markets.

With so much at stake, speculators use several trading tools to identify price trends and to tip the risk-reward balance in their favor. Three popular technical trading tools—moving averages, relative strength index, and stochastics—are easy to chart with the worksheet in figures 1



```
     A       B       C       D     E      F      G     H    I    J    K     L     M     N      O      P
1  Three Methods for Timing the Commodities Markets                       @DATE(89,{?})~{DOWN}
2  ---------------------------------------------------
3                                             Fast    Slow
4  Date:      10/20/89                        Avg     Avg          Signal
5                                          ----------------        ------
6  Moving Averages (9-day and 14-day):        5.63    5.58         Buy/Hold
7  Relative Strength Index (9-day):          59.62      --         Hold/Wait
8  Stochastics (20-day):                     48.97   50.27         Sell/Wait
```

FIGURE 1

and 2. Range A13..A42 of figure 2 records trading dates between September 11 and October 20 of last year. Range B13..D42 contains price information for a bushel of soybeans (in dollars per bushel) for this period. To build this worksheet, use the instructions in the set-up box.

These three techniques can be used with any financial instrument that reports daily price fluctuations, not just with commodities. In fact, these technical indicators are akin to the technical elves that attempt to determine the general direction of the stock market on PBS's *Wall Street Week*.

Because of the very high risk associated with the commodities markets, you may want to use this model to trade less-leveraged investments. One commodities contract is quite costly. A speculator can put up a relatively small amount of cash, called margin, for the contract, but this means that an unfavorable market can wipe out the cash investment and create a huge indebtedness as well.

Moving Averages

Moving averages smooth out the daily fluctuations in prices and provide indications of future trends. A moving average of closing prices is calculated by adding closing prices for the last *x* days, then dividing the sum by *x*. When a new closing price becomes available, the oldest price is dropped and the average is recalculated.

To calculate a 10-day moving average on closing prices, collect the closing prices for the last 10 trading days. Total these closing prices and divide the sum by 10. Next day, replace the 10-day-old number with that day's closing price, retotal the prices, and divide the new sum by 10. Repeat this process each day.

Generally, the larger the number of days used to calculate a moving average, the smoother the trend will be and the slower the moving average will be in detecting a change in the price trend. In commodities trading, two widely used averages are 9-day and 14-day (also known as 9-bar and 14-bar, respectively).

Columns E and F of figure 2 show 9-day and 14-day moving averages for soybean prices between September 11 and October 20 of last year. After prices for nine days have been recorded, the @AVG function in cell E21 calculates the first 9-day moving average. The formula is copied down the column, so each cell in column E contains an average of the previous nine days' closing prices.

The same procedure is used in column F, starting on day 14 (cell F26) with the formula @AVG(D13..D26). This formula averages the previous 14 days' closing prices from column D.

There are as many ways to interpret these averages as there are users. The rule most commonly used by commodities traders is as follows: If the faster-moving average (9-bar) crosses the slower-moving average (14-bar) from below, prices should trend higher; if the crossover is from above, prices should trend lower.

For an example of this crossover, look at the formula results in range E38..F40. In row 38 the 9-day moving average is 5.57, lower than the 14-day average of 5.58. In row 39, the two averages are roughly equivalent at 5.58 (they're actually different by a fraction of a cent). But in row 40, the 9-day moving average is 5.61, higher than the 14-day average of 5.57. In this case, the 9-day average crosses the 14-day average from below.

The types of moving averages a trader uses (9-day, 14-day, etc.) depend on personal preference and experience. No type is perfect for all markets. Most libraries carry detailed source material on the use of moving averages in various commodities and financial markets.

Relative Strength Index

At the beginning of a major upward or downward movement in market values, prices advance or decline slowly. Once an upward trend is established, the market records bigger gains on up days. Once a downward trend is established, the market records bigger losses on down days.

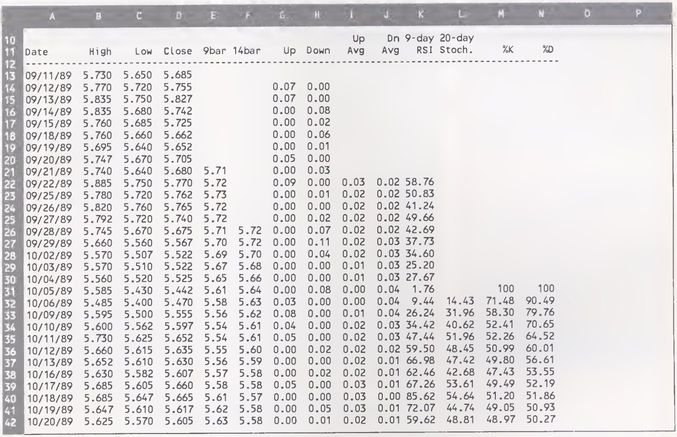
Consider a trend of rising prices. This uptrend is often interrupted by down days with relatively smaller losses. But as prices near a peak, the up-day gains and down-day losses approach equilibrium.

The relative strength index (RSI) is a mathematical formula that compares the average change on up days with the average change on down days. The first step in calculating the RSI is identifying up and down days in the closing-price data for the commodity. @IF formulas in column G determine whether the day's closing price is higher than that of the previous day. If it is, the formula returns the difference between the two prices. Otherwise, it returns a zero. The formulas in column H work the same way, but they record differences in closing prices on down days rather than up days.

The second step in calculating the RSI is averaging the up and down amounts for a predetermined length of time. This example uses a 9-day RSI, so data for the past nine trading days are averaged in range I22..J22 by the following formulas:

Cell	**Formula**
I22	@AVG(G14..G22)
J22	@AVG(H14..H22)

These formulas are copied down columns I and J so that you get an updated average for each new day.



```
       A          B      C      D      E     F     G     H      I      J     K      L      M      N      O      P
10                                                                 Up     Dn 9-day 20-day
11 Date        High    Low  Close  9bar 14bar    Up  Down    Avg    Avg   RSI Stoch.     %K     %D
12 ---------------------------------------------------------------------------------------------
13 09/11/89  5.730  5.650  5.685
14 09/12/89  5.770  5.720  5.755                0.07  0.00
15 09/13/89  5.835  5.750  5.827                0.07  0.00
16 09/14/89  5.835  5.680  5.742                0.00  0.08
17 09/15/89  5.760  5.685  5.725                0.00  0.02
18 09/18/89  5.760  5.660  5.662                0.00  0.06
19 09/19/89  5.695  5.640  5.652                0.00  0.01
20 09/20/89  5.747  5.670  5.705                0.05  0.00
21 09/21/89  5.740  5.640  5.680  5.71          0.00  0.03
22 09/22/89  5.885  5.750  5.770  5.72          0.09  0.00   0.03   0.02 58.76
23 09/25/89  5.780  5.720  5.762  5.73          0.00  0.01   0.02   0.02 50.83
24 09/26/89  5.820  5.760  5.765  5.72          0.00  0.00   0.02   0.02 41.24
25 09/27/89  5.792  5.720  5.740  5.72          0.00  0.02   0.02   0.02 49.66
26 09/28/89  5.745  5.670  5.675  5.71  5.72  0.00  0.07   0.02   0.02 42.69
27 09/29/89  5.660  5.560  5.567  5.70  5.72  0.00  0.11   0.02   0.03 37.73
28 10/02/89  5.570  5.507  5.522  5.69  5.70  0.00  0.04   0.02   0.03 34.60
29 10/03/89  5.570  5.510  5.522  5.67  5.68  0.00  0.00   0.01   0.03 25.20
30 10/04/89  5.560  5.520  5.525  5.65  5.66  0.00  0.00   0.01   0.03 27.67
31 10/05/89  5.585  5.430  5.442  5.61  5.64  0.00  0.08   0.00   0.04  1.76            100    100
32 10/06/89  5.485  5.400  5.470  5.58  5.63  0.03  0.00   0.00   0.04  9.44  14.43  71.48  90.49
33 10/09/89  5.595  5.500  5.555  5.56  5.62  0.08  0.00   0.01   0.04 26.24  31.96  58.30  79.76
34 10/10/89  5.600  5.562  5.597  5.54  5.61  0.04  0.00   0.02   0.03 34.42  40.62  52.41  70.65
35 10/11/89  5.730  5.625  5.652  5.54  5.61  0.05  0.00   0.02   0.03 47.44  51.96  52.26  64.52
36 10/12/89  5.660  5.615  5.635  5.55  5.60  0.00  0.02   0.02   0.02 59.50  48.45  50.99  60.01
37 10/13/89  5.652  5.610  5.630  5.56  5.59  0.00  0.00   0.02   0.01 66.98  47.42  49.80  56.61
38 10/16/89  5.630  5.582  5.607  5.57  5.58  0.00  0.02   0.02   0.01 62.46  42.68  47.43  53.55
39 10/17/89  5.685  5.605  5.660  5.58  5.58  0.05  0.00   0.03   0.01 67.26  53.61  49.49  52.19
40 10/18/89  5.685  5.647  5.665  5.61  5.57  0.00  0.00   0.03   0.00 85.62  54.64  51.20  51.86
41 10/19/89  5.647  5.610  5.617  5.62  5.58  0.00  0.05   0.03   0.01 72.07  44.74  49.05  50.93
42 10/20/89  5.625  5.570  5.605  5.63  5.58  0.00  0.01   0.02   0.01 59.62  48.81  48.97  50.27
```

FIGURE 2

Finally, cell K22 calculates the first 9-day RSI by using the formula +I22/(I22+J22)*100. This formula divides the 9-day average of up days in cell I22 by the sum of the 9-day up-day and down-day averages, then multiplies the result by 100.

When prices are rising, the up-day average exceeds the down-day average, and the RSI rises. The reverse is true when prices are declining. In this formula, the RSI oscillates between 0 and 100. An RSI above 70 usually means that the market is overbought and is due for a pullback. At the other extreme, an RSI below 20 usually means that the market is oversold and due for a rise.

Stochastics

The third indicator in this worksheet, the stochastic, is also an oscillator. A stochastic value measures the relation between today's price and the highest and lowest prices of the commodity in the past few days. This relation is then presented on a 0-to-100 scale.

For example, if the closing price today is 45 and the lowest and highest prices for the last 20 days are 40 and 50, the stochastic oscillator is 50. (Today's price of 45 is exactly halfway between the lowest and highest prices for the last 20 days.) This value is called the raw stochastic. Like moving averages and the RSI, a new raw stochastic is calculated for each new trading day. The mathematical formula for a 20-day stochastic value is defined in cell L32:

```
(D32–@MIN(C13..C32))/
  (@MAX(B13..B32)
  –@MIN(C13..C32))*100
```

Raw stochastic values calculated with this formulas tend to fluctuate greatly. Two additional stochastic formulas are used to smooth out these fluctuations. These formulas, located in columns M and N in the worksheet, generate values called %K (fast stochastics) and %D (slow stochastics). The first smoothing formulas are in cells M32 and N32:

Cell	***Formula***
M32	+M31*2/3+L32/3
N32	+N31*2/3+M32/3

The formulas in column M calculate the fast stochastic by adding two thirds of the previous day's smoothed value and one third of the current day's raw stochastic. This method "weighs down" the raw stochastic with the previous day's average.

The slow stochastic formulas in column N work on the same principle, but they use the fast stochastic as an input, along with the previous day's average. Thus, the slow stochastic reacts much more slowly to wild swings in the raw stochastic.

The starting values of the stochastics in cells M31 and N31 are set to 100. It's standard practice to use 100 as the base value for the previous day's stochastic when calculating the first stochastics in the series—in this case, those in range M32..N32.

As mentioned earlier, a stochastic, like the RSI, is an oscillator that produces index values. However, like the 9-day and 14-day moving averages, stochastic indicators are used together. When the fast stochastic (%K) crosses the slow stochastic (%D) from below, that is a signal to buy. When the fast stochastic crosses the slow stochastic from above, that is a signal to sell.

Using the Model

Follow the instructions beginning on this page to set up the commodities-trading worksheet. The indicators in figure 1 should be in the top window of your *1-2-3* or *Symphony* worksheet. To use the model, you don't have to change any item in this window except the date in cell B4.

The cell pointer should be in the bottom window. To use your own data in the worksheet, erase the dates and soybean prices from range A13..D42. Then press the WINDOW key (F6 on most computers) to move the cell pointer to the top window. To enter dates for 1990, modify the macro in cell L1 so that it reads @DATE(90,{?})~{DOWN}.

Move the cell pointer back to the lower window and use the macro to enter the trading dates for your analysis. Enter high, low, and closing prices for the commodity you're tracking in columns B, C, and D. As explained above, you need at least nine consecutive days of trading data to obtain relevant indicators.

If you plan to enter a large amount of market data into this spreadsheet, you can use a specialized communications-software package and a modem to link your spreadsheet directly to a data source and save yourself the trouble of entering the data manually.

There are several such packages offering a wide range of market-pricing services. Among the industry leaders are *Dow Jones Spreadsheet Link,* from Dow Jones & Co., Princeton, N.J.; *Exchange Master*, from Warner Computer Systems, Fair Lawn, N.J.; and *The DownLoaders*, from Equis International, Salt Lake City, Utah.

On the tenth and following days, after you enter the day's trading information in the lower window, move the cell pointer back to the top window. Then enter the current date in cell B4. You must keep the date in cell B4 current because each of the formulas in range F6..G8 uses it as the value to look up in an @VLOOKUP expression. The table range for the lookup, named *table*, is located in range A13..N72. When your database expands beyond 60 days of trading information, you must expand this range by using the Range Name Create command.

The offset value is different for each formula. For example, the formula in cell F6 uses an offset value of 4. This means that the formula in cell F6 looks down the first column of *table* for the date that corresponds to your entry in cell B4. It then returns the value four columns to the right—in this case, the value in column E. If cell B4 is out of date, you will get a signal that was valid at some point in the past but that is not currently valid.

The signal formulas in range I6..I8 depend on the formulas directly to their

HOW TO SET UP THE COMMODITIES -TRADING WORKSHEET

1. Releases
This model works in *1-2-3* Releases 2.01 and higher and in *Symphony* Releases 2.0 and 2.2.

2. Global default
Cell format: Fixed 2

1-2-3. /Worksheet Global Format Fixed, press Return
Symph: MENU Settings Format Fixed, press Return, select Quit

3. Column widths

Column	*Width*
B	10
C	7
D	7
E	6
F	8
G	8
H	6
I	6
J	6
K	6
L	7
M	7
N	7

For example, to set the width of column B, place the cell pointer in column B and select /Worksheet Column Set-Width (*Symph*: MENU Width Set), and enter *10*.

4. Cell formats

Format	*Range*
Date 4	B4, A13..A42
Fixed 3	B13..D42
Fixed 0	M31..N31

For example, to assign the Date 4 format to cell B4, select /Range Format Date 4 (*Symph*: MENU Format Date 4), and indicate cell B4

5. Labels
Enter the labels in figures 1 and 2. Do not enter the labels marked in brown. Begin the entry in cell L1 and the labels in ranges E11..F11 and K10..L10 with an apostrophe. Enter a quotation mark and two hyphens ("--) in cell G7. To create the dashed lines, enter a backslash and a hyphen (\-) in cell A2 and copy it across the row as needed. Center the labels in range F3..G4. Select /Range Label Center (*Symph*: MENU Range Label-Alignment Center), and indicate range F3..G4. To right-align the labels in range B10..N11, use the Range Label Right command (*Symph*: MENU Range Label-Alignment Right).

6. Values
Enter all values in ranges B13..D42 and M31..N31.

7. Range unprotect
To make data-entry cells stand out, select /Range Unprotect (*Symph*: MENU Range Protect Allow-Changes), and indicate cell B4 and ranges A13..D42 and M31..N31.

8. Range names

Name	*Range*
date	B4
move9	F6
move14	G6
rel9	F7
stoch9	F8
stoch14	G8
table	A13..N72
\d	L1

For example, to assign the range name *date*, press slash (*Symph*: MENU), seleft. If the 9-day moving average is higher than the 14-day moving average, the moving average formula in cell I6 displays *Buy/Hold*. If the 9-day moving average is lower than the 14-day moving average, the formula in cell I6 displays *Sell/Wait*.

According to the moving-average theory explained above, a *Buy/Hold* signal means that you should be long in the market—that you should buy the commodity if you haven't already bought it, and hold onto it if you have. A *Sell/Wait* signal means that you should be short—that you should sell the commodity if you own it, and stay out of the market if you don't.

The signal changes whenever a crossover occurs. However, the moving-average signal isn't valid until the first time it changes.

The stochastic signal in cell I8 works just the same way that the moving-average signal does. The signal displays either *Buy/Hold* or *Sell/Wait*. When the fast stochastic (%K) crosses the slow stochastic (%D), the signal changes. This signal always displays *Sell/Wait* until the occurrence of the first crossover.

The RSI signal in cell I7 works slightly differently. Three signals are possible: *Buy*, *Hold/Wait*, and *Sell*. If the current RSI reading is greater than 70, the formula returns a *Sell* signal. If the current RSI is below 20, the formula returns a *Buy* signal. If the current RSI is between 20 and 70, the formula returns a *Hold/Wait* signal.

So how effective are these technical tools in predicting the markets? Consider the soybean market in September and October of last year. By substituting consecutive trading dates into cell B4, you can see exactly when each signal changed.

The results from this exercise are mixed. The RSI gave a *Buy* signal on October 5, when soybean prices closed at about $5.44 per bushel. The moving-average indicator did not generate a *Buy/Hold* signal until October 17, when prices closed at about $5.66 per bushel. The following day, the RSI indicated *Sell* at just about the same price. The stochastic indicator, meanwhile, never budged from its *Wait* recommendation.

As it happens, the RSI would have gotten you in and out of soybeans at a handy profit during this time period. Does this mean that the RSI is preferable to the other two indicators? Not at all! Under other market conditions, the other two indicators could easily generate a better signal than the RSI. The prudent and cautious trader waits until all three are in agreement before deciding whether to venture into the commodities market. And as countless investors have found over the centuries, there is no such thing as an infallible system. Technical indicators are but one technique that may improve your odds a bit. ■

Anil Gulati is assistant professor of quantitative methods and computer information systems at Western New England College.

The model in this article can be downloaded from CompuServe. For more information, see the box on page 4.

lect Range Name Create, enter the word *date*, and indicate cell B4.

9. Formulas

Enter the dates in cell B4 and range A13..A42. All dates must be entered using the @DATE function, which has the syntax @DATE(*yy,mm,dd*). To speed entry of dates, place the cell pointer in the desired cell, hold down the MACRO key (Alt on most computers), and press D. The date macro in cell L1 enters *@DATE(89,* in the cell and waits for you to type the month, a comma, and the day, and to press Return. The macro then completes the formula and moves the cell pointer down one row.

Enter the following additional formulas:

Cell	***Formula***
F6	@VLOOKUP(date,table,4)
F7	@VLOOKUP(date,table,10)
F8	@VLOOKUP(date,table,12)
G6	@VLOOKUP(date,table,5)
G8	@VLOOKUP(date,table,13)
I6	@IF(move9>move14,"Buy/Hold", "Sell/Wait")
I7	@IF(rel9<20,"Buy",@IF(rel9>70, "Sell","Hold/Wait"))
I8	@IF(stoch9>stoch14,"Buy/Hold", "Sell/Wait")
E21	@AVG(D13..D21)

Copy the formula in cell E21 to range E22..E42.

F26	@AVG(D13..D26)

Copy the formula in cell F26 to range F27..F42.

G14	@IF(D14>D13,D14-D13,0)
H14	@IF(D14<D13,D13-D14,0)

Copy range G14..H14 to range G15..G42.

I22	@AVG(G14..G22)
J22	@AVG(H14..H22)
K22	+I22/(I22+J22)*100

Copy range I22..K22 to range I23..I42.

L32	(D32-@MIN(C13..C32))/(@MAX (B13..B32)-@MIN(C13..C32))*100
M32	+M31*2/3+L32/3
N32	+N31*2/3+M32/3

Copy range L32..N32 to range L33..L42.

10. Windows and titles

Place the cell pointer in cell A9. In *1-2-3* select /Worksheet Window Horizontal. Press the WINDOW key (F6 on most computers) to jump to the bottom window. Press the ScrollLock key, press DownArrow once, then press ScrollLock again. Place the cell pointer in cell A13 and select /Worksheet Titles Horizontal.

In *Symphony*, select SERVICES Window Create. Enter *lower* for the new window name and select the SHEET environment. Press the period key two times, then press DownArrow nine times. Press Return, then select Restrict Range, indicate range A9..IV8192, and select Quit. Press the ScrollLock key, press DownArrow once, then press ScrollLock again. Place the cell pointer in cell A13 and select MENU Settings Titles Horizontal Quit.

11. Column widths

Set column widths in the lower window as follows:

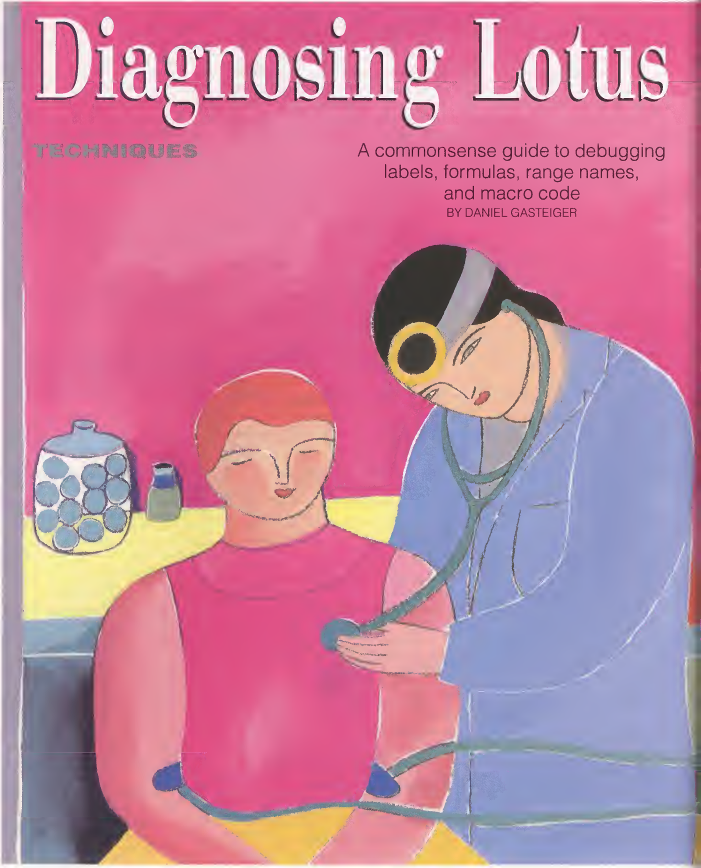
Column	***Width***
B	7
F	6
G	6

TECHNIQUES

Diagnosing Lotus

A commonsense guide to debugging labels, formulas, range names, and macro code

BY DANIEL GASTEIGER



KAREN BARBOUR

Models

You found the model of your dreams in the pages of *LOTUS:* a check register. But after spending hours following the directions, fixing small errors, and even consulting the local spreadsheet whiz, you're stymied. The model still refuses to work. Instead of flawlessly recording each transaction, it issues the message *Invalid range in PUT (AB91).*

When all efforts to fix a model fail, don't despair. Instead, review this guide to building and debugging our models. Most problems occur because of errors in labels, formulas, range names, or macro code. And most have simple solutions. For a few tips on building models and avoiding these snafus altogether, see the box in this article.

Strange Labels

Labels are the most straightforward of all spreadsheet data. Even labels, however, can cause a few snags. The most common problem occurs when you try to enter a label that begins with any of the following characters: @ # $ ^ (– + ' " ¦ \ / . <.

Ordinarily, these characters tell *1-2-3* and *Symphony* to perform specific tasks: for example, to enter what follows as a formula, to display the menu, or to create a repeating label. When you enter a label that begins with one of these characters, you *must* precede it with an apostrophe or with one of the other label-prefix characters (^ or "). This tells the program that what follows is, in fact, a label.

If you enter a label and it doesn't match the label in the figure you're referring to, reenter it with a label prefix. For example, if you forget to add an apostrophe prefix to the label \t, you will get a cell filled with the letter *t* instead of the two characters \t.

Occasionally, labels in a figure appear in color type. The setup box usually instructs you not to enter such labels because they are the results of formulas or macro commands that you'll enter in another step.

Also, to conserve space, *LOTUS* sometimes prints figures whose columns are too narrow to reveal the complete contents of some cells. This often occurs in figures containing macro code, which consists of long labels. Always refer to the setup box for the complete contents of those cells.

Formula Woes

When typing a formula from the setup box into your worksheet, enter only the characters shown. Once entered in a cell, the formula immediately calculates and displays its result. Therefore, what appears in the cell in your worksheet won't resemble what appears in the setup box. Fortunately, though, there is a way to check your work.

To confirm that a cell contains a particular formula, move the cell pointer to that cell. The contents of the cell appear in the control panel. If the formula is too long to fit across one screen, press the EDIT key (F2 on most computers). A copy of the cell's contents appears on the edit line, and you can move the cursor through it as you compare it with the formula printed in the magazine.

Type the formula @STRIG(A7,0) in cell A1 of an otherwise blank worksheet. When you press Return, the computer beeps, the EDIT indicator flashes on, and a copy of the formula appears on the edit line. Now what?

First look at the position of the cursor on the edit line. It is on the at sign (@), which indicates that the function name to the right of the sign is invalid. In this case, the correct @function name is @STRING, not @STRIG. To correct the formula, use the RightArrow key to move the cursor to the *G* in *STRIG*, type an *N*, and press Return.

Now type the formula @STRING (A7+A9),0) in cell A2. When you press Return, the cursor jumps to the comma in the formula. The comma and the zero are not incorrect. Whenever the cursor jumps to an apparently arbitrary place in the formula, suspect such problems as mismatched parentheses or quotation marks or misplaced punctuation.

In this example, the problem is mismatched parentheses, and there are two possible solutions. Either delete the right parenthesis before the comma or enter another left parenthesis after the word *STRING*. Let's fix the problem by deleting the extraneous parenthesis.

Now type the formula @INDEX (A10..C15, 2, 3) in cell A3. The flaw in this formula is its surplus spaces. (In *1-2-3* Release 3, extra spaces within a formula don't create a problem because the program automatically deletes them when you press Return.) When you press Return, the software identifies the error by moving the cursor to the space before the *2*. To correct the error, press the Delete key to remove the space. Then use the RightArrow key to move the cursor to the space before the *3* and delete it as well. Finally, press Return to enter the corrected formula.

MISSING OR MISSPELLED RANGE NAMES ARE THE MOST COMMON MODEL-BUILDING ERRORS.

Sometimes extra spaces *appear* to be scattered throughout a formula in the setup box. Disregard those. When copying a formula from the magazine, do not include spaces that appear between characters unless they are within a string surrounded by quotation marks.

Move the pointer to cell A4 and type the formula @STRING(C7,0). Then press the Spacebar once, press Return, and watch the control panel very carefully. The cursor moves just slightly to the left. The formula looks exactly like the formula in the setup box. But instead of accepting the formula, the program beeps and changes to Edit mode. The only way to determine the problem here is to press the End key or the RightArrow key. The cursor moves just slightly to the right, revealing the extra space. Press the Backspace key to remove the space, and press Return.

Truant Range Names

Type the formula @STRING(A7,decs) in cell A5. The result you get depends on the release of *1-2-3* you use. In *1-2-3* Release 2.01/2.2 or in *Symphony*, the cursor jumps to the first character of the string *decs*, which indicates that something is wrong with that string. In *1-2-3* Release 3, the program accepts the formula but returns ERR.

Suppose a quick glance at the formula section of the setup box confirms that you entered the formula correctly. You have range name troubles.

1-2-3 Releases 2.01/2.2 and *Symphony* won't accept a formula that refers to an unnamed range. But you can't fix the problem without abandoning the formula. Or can you?

Instead of pressing Escape to clear the formula, press the Home key, type an apostrophe, and then press Return. This converts the formula into a label, which the program accepts.

Now no matter which product and release you're using, check whether you assigned the name *decs*. There are several ways to do this, but the fastest is to press the GOTO key (F5 on most computers) and enter the name *decs*. If a range with that name exists, the cell pointer jumps to the upper-left cell of that range. If it doesn't exist, you get the error message *Invalid cell or range address.*

If the error message appears, press the Escape key. Then look in the range names section of the setup box for a list of all the named ranges in the model. Locate the name *decs* in the list. Let's say that *decs* should be assigned to cell B19.

In most setup boxes, the list of named ranges is broken into two groups. One group consists of ranges whose names you assign by using the Range Name Create command. The other group consists of ranges whose names you assign by using the Range Name Labels Right command. The instructions following the list explain which command to use for which group.

If *decs* is a range whose name you assign by using the Range Name Create command, press slash (in *Symphony*, MENU), select Range Name Create, and specify cell B19. If *decs* is part of a whole series of names that you assign by using the Range Name Labels Right command, chances are that if you didn't name *decs*, you also didn't name the other ranges in that group. The setup box will instruct you to press slash (in *Symphony*, MENU), select Range Name Labels Right, and specify the range containing the labels that will name the cells to their right.

Once you have assigned the range name, move the cell pointer to the cell containing the label version of the formula. Delete the apostrophe that precedes the formula. The program should accept the formula.

Don't be alarmed if the program still doesn't accept the formula. It may contain another small error. Make sure that the range name in the formula exactly matches the range name you assigned. Leading and trailing spaces erroneously tacked onto a range name are virtually imperceptible.

To locate a trailing space in a range name that you assigned using the Range Name Labels command, move the cell pointer to the cell containing the range name in question and press the EDIT key. If there is a space between the edit-line cursor and the last character in the range name, press the Backspace key to delete the space and press Return. Then press slash (in *Symphony*, MENU), select Range Name Delete, and delete that range name. Finally, move the cell pointer to the cell containing the range name, press slash (in *Symphony*, MENU), select Range Name Labels Right, and press Return.

It's impossible to locate a trailing space in a range name that you assigned by using the Range Name Create command. Instead, delete the troublesome range name and then reassign the name.

Jumping around the worksheet to examine names is time consuming. Fortunately, there is a shortcut. When range name trouble strikes, move the cell pointer to the top-left cell of two adjacent blank columns. Then press slash (in *Symphony*, MENU), select Range Name Table, and press Return. An alphabetical list of range names and their addresses appears. Compare this list with the list of range names in the setup box and you should easily spot any misspellings.

Macro Errors on the Run

Errors that occur while a macro is running fall into two types. The first type is benign and usually generates an error message that leads you directly to the problem. The second type is insidious: The program gives you no warning and leaves you to find and correct the problem and clean up the havoc that the macro wreaked.

Let's build a sample faulty macro so that we can examine some fairly harmless errors. Sure, they'll cause the macro to crash. But they'll also provide a clue about how to fix the problem. Clear your worksheet by selecting /Worksheet Erase Yes (in *Symphony*, SERVICES New Yes). Enter the labels and all the values except the one shown in cell B2 of the figure below.

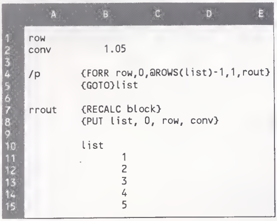
Precede the entry in cell A4 with an apostrophe. Assign the labels in column A as names for the adjacent cells in column B. Press slash (in *Symphony*, MENU), select Range Name Labels Right, and specify range A1..A7. Then use the Range Name Create command to assign the name *list* to range B11..B15. Finally, enter the formula @INDEX(list,0,row)*1.05 in cell B2.

To run the macro, hold down the MACRO key (Alt on most computers) and press P. The computer just beeps. How could something be wrong already?

When a macro fails to start, the probable cause is an error in the macro name. Look at cell A4 of the worksheet. That cell contains the label */p*. The macro name must begin with a backslash (\) so that you can start the macro by pressing the MACRO key. Typing a slash instead of a backslash is a common error.

To fix the error, enter '*\p* in cell A4. Then use the Range Name Delete command to delete the range name */p*, and use the Range Name Labels Right command to assign the name \p to cell B4.

Press MACRO-P to start the macro again. This time the computer beeps and the error message *Unrecognized key/range name {...} (B4)* appears, which indicates that a macro key word or range name within the braces in cell B4 makes no sense to the software. For starters, {FORR} is an invalid macro key word. It should be {FOR}. Press the Escape key to clear the error. Then edit the entry in cell B4 to remove the extra *R*.



```
     A         B           C          D          E
 1   row
 2   conv          1.05
 3
 4   /p        {FORR row,0,@ROWS(list)-1,1,rout}
 5             {GOTO}list
 6
 7   rrout     {RECALC block}
 8             {PUT list, 0, row, conv}
 9
10             list
11                   1
12                   2
13                   3
14                   4
15                   5
```

Try the macro again. This time the error message *Invalid range in FOR (B4)* appears. Now the program recognizes the {FOR} key word, but it doesn't recognize a range address or range name used within the command. To determine which argument is causing the problem, press the Escape key to clear the error message. Then match each range argument in the command with a range name listed in the setup box.

Let's say that this model's setup box contained the following range name list:

Name	***Range***
block	B1. B2
conv	B2
list	B11..B15
row	B1
rrout	B7
\p	B4

The range names *row* and *list* are in the table, but the name *rout* isn't. Perhaps it should be *rrout*, the name assigned to cell B7. Correct the problem by changing *rout* in the {FOR} statement to *rrout*.

Run the macro. Yet another error message appears. This time it reads *Invalid range in RECALC (B7)*. Check the name *block* against the table. It should be assigned to range B1..B2. It's easy to skip a name or two when you're assigning several from a long list. Press the Escape key to clear the error and then use the Range Name Create command to assign the name *block* to range B1..B2.

Try the macro again. The message *Invalid integer in PUT (B8)* appears. What could that mean? Close examination of the {PUT} command reveals a space after each comma. Within the braces of a macro command, the key word is separated from the arguments by one space, and the arguments are separated from each other by argument separators—for example, commas. (The only exceptions to this rule are the {GETLABEL} and {GETNUMBER} macro commands.) To fix the {PUT} command, remove the space after each comma.

Now run the macro. This time, the values in the range named *list* increase by 5%. But what does the message *Enter address to go to: list* mean? And why is the program suddenly in Edit mode?

To stop the macro, hold down the Control key and press Break. Because you assigned a range to the name *list* earlier, you know that's not the problem. Instead, the problem is with the {GOTO} command in row 5. This command works just like the GOTO key. To execute the command manually, you press GOTO, type a cell address or range name, and press Return. The line of macro code containing the {GOTO} command lacks a tilde, which is the macro equivalent of pressing the Return key. Move the pointer to cell B5, press the EDIT key, type a tilde, and press Return.

Now give the macro another try. It works. The values in the range named *list* increase by 5%, and the cell pointer ends up in cell B11.

Before continuing, let's make one small enhancement to the macro. Suppose you want each value in the range named *list* to update immediately. Just add a tilde to the end of the {PUT} statement in cell B8. Position the cell pointer in cell B8, press the EDIT key, type a tilde, and press Return. Now start the macro. Each value in *list* udpates one by one while the macro is running.

Data-Loss Disasters

Errors that occur within the braces of a macro command are easy to correct. But errors that are scattered outside the braces can be nasty.

It's difficult to categorize the errors caused by extraneous or invalid characters entered outside the braces of a macro command. However, when a macro performs oddly and doesn't produce an error message, suspect that a typographical error is hiding somewhere in the code.

Continue working with the simple model that you just debugged. Let's create a macro error that's guaranteed to destroy data. Move the cell pointer to cell B7, press the EDIT key, press the Spacebar once, and press Return. The entry appears unchanged.

Now run the macro to see the chaos one space can cause. Move the cell pointer to cell B2 and press MACRO-P. Goodbye data. The macro entered that extra space into the "current" cell five times, thereby replacing the formula in cell B2 with an apostrophe and most of the values in the range named *list* with spaces. Although the macro code looked perfect, it ate most of the data that it was supposed to increase in value. Even worse, the macro gave no warning of its destruction.

BASIC TRAINING

Most *LOTUS* models are accompanied by a setup box that contains the directions for building the model. The box also lists the products and releases in which the model works. Always build the model in one of the listed products and releases.

The directions in the setup box appear in numbered sequence. Before you build the model, read all the directions. One instruction might read "enter all the labels shown in the figures." But the next instruction might be "omit for now the entries printed in color." You'll need to know that before you type away.

Don't skip a step because you think it's pointless. When you begin to build a model, you don't know how finicky it will be. It may require particular column widths, format settings, and label alignments. Ignoring even the most seemingly superficial instruction may result in a misbehaving model. In addition, some of the procedures in the setup box won't work unless you have completed procedures described in earlier steps.

When you finish building the model, save it to two separate files *before* entering data into it. For example, save the model under the file name ORIG, for original, and TEST, for test model. Then work with the version named TEST.

Enter the sample data into TEST and follow the examples included in the article to get a feel for how the model works. If the model falters, figure out what's wrong and make the correction to TEST. Repeat this process until your model delivers the results promised in the article. If a total disaster occurs while you are working with TEST, you can always retrieve ORIG and start all over again. When the model is running smoothly, substitute your data for our data or modify the model to meet your needs.

—D. G.

To check a macro for this type of error, compare your entries character by character with those printed in the magazine. And use the EDIT key to hunt for spaces at the end of each line of code. If the error still doesn't turn up, ask a co-worker to proofread your efforts.

Win the War

When you're ready to surrender to a misbehaving macro, pull out the big guns: Step mode. In Step mode, you run a macro one character or key word at a time. To activate Step mode, press the STEP key (in *1-2-3*, hold down the Alt key and press F2 [in Release 3, select Step from the resulting menu]; in *Symphony,* press Alt-F7).

Then start the macro. Now each time you press a key, the program executes a single macro step, which is any command within braces or any single character outside the braces. *1-2-3* Release 2.2 and *Symphony* Release 2.2 also display the line of macro code that is currently being executed. This allows you to preview the character about to be processed.

Watch the macro's progress carefully until the error turns up. Then press Control-Break to stop the macro. Disable Step mode by pressing the STEP key a second time. Now begin troubleshooting the section of the macro that was running when the error arose.

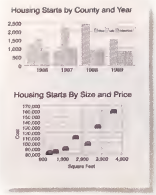
When All Else Fails...

If none of these remedies cures your ailing model, feel free to consult an editor at *LOTUS*. Once in a great while, we make mistakes. If a model contains an error, we want to know so that we can print a correction in the @ERR box of an upcoming issue.

Or to avoid entering and debugging models altogether, go on line to CompuServe, where you'll find working versions of the models that appear in the magazine. For details on accessing the models, see the box on page 4.

Daniel Gasteiger is a *1-2-3* and *Symphony* consultant in Boston and a contributing editor to *LOTUS*.

Wow.



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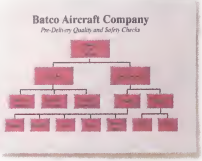

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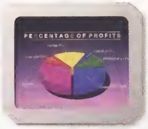

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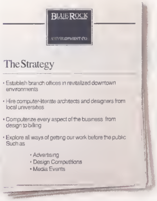

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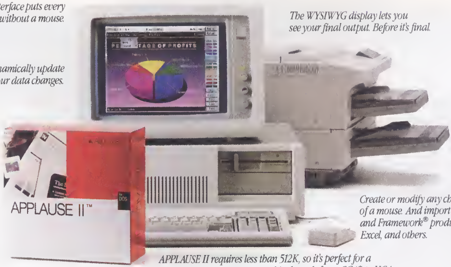

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Q&A ?????

Answers to Your Questions About Lotus Products

1-2-3

Find records fast

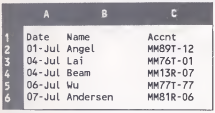
Q I've created a large database in *1-2-3* that includes fields for the date, supplier code, customer name, and account number. I use the Data Sort command to arrange the records alphabetically, and then I scroll through the data until I find a particular record.

I'm sure there's a faster way to find records. Can you explain how?

John T. Barnett
Ralph A. Hiller Co.
Pittsburgh, Pa.

A There are two ways to find records quickly. One method is the Range Search command, which is available in *1-2-3* Releases 2.2 and 3. The other method, which is available in all releases of *1-2-3*, is the Data Query Find command.

To follow the discussion, create a database by entering the labels in row 1 and range B2..C6 of the following figure. Use the @DATE formula to enter the dates in column A and assign them the Date 2 format.



	A	B	C
1	Date	Name	Accnt
2	01-Jul	Angel	MM89T-12
3	04-Jul	Lai	MM76T-01
4	04-Jul	Beam	MM13R-07
5	06-Jul	Wu	MM77T-77
6	07-Jul	Andersen	MM81R-06

The Range Search command can locate a specified sequence of characters within any label or formula in a selected range. Suppose you want to find Beam's record. Select /Range Search and indicate range A1..C6. *1-2-3* displays the prompt *Enter string to search for.* Enter *Beam* and select Labels.

1-2-3 displays a menu with the options Find and Replace. The Replace option lets you indicate a string that *1-2-3* should substitute for any occurrence of *Beam* that it finds in the database. You don't want to change *Beam,* so select Find.

The cell pointer jumps to cell B4, and *1-2-3* displays a menu with the options Next and Quit. You would select Next to move the cell pointer to the next *Beam* in the database. Since there is only one record for Beam, select Quit to end the search. The cell pointer remains at the selected record.

The Data Query Find command is more versatile because it lets you specify a set of criteria that a record must meet. If a record meets the criteria, the command highlights the record so that you can read and edit it.

Before you issue the Find command, you must enter the criterion and specify the Input and Criterion ranges. Enter *Name* into cell E1, and enter *Beam* into cell E2. Select /Data Query Input and indicate range A1..C6. Select Criterion and indicate range E1..E2, then select Find. *1-2-3* highlights Beam's record.

While the record is highlighted, you can move the cursor from one field to the next and replace existing entries, or you can press the EDIT key to change the entries. Use the UpArrow and DownArrow keys to highlight other records that match the criterion. When you finish perusing the records that match the criterion, press Return and then select Quit to end the Find operation. The cell pointer returns to where it was when you issued the Data Query Find command. Alternatively, you can press the QUERY key to end the Find operation and leave the cell pointer in the last highlighted record.

1-2-3 / SYMPHONY

Days to year end

Q I'd like to have *1-2-3* calculate the number of days left in the current year. The formula I use requires that I update an @DATE formula at the beginning of a new year, but I'd like to eliminate that task. Any suggestions?

Charles H. Marks
Charles Marks & Associates
Boston, Mass.

A The following formula returns the total number of days left in the current year, not including today:

@DATE(@YEAR(@NOW),12,31)–@INT(@NOW)

If you want to include today in the count, change the formula to the following:

@DATE(@YEAR(@NOW+1),1,1)–
@INT(@NOW)

No links to protected files

Q I created a main file linked by formulas to six subordinate files in *1-2-3* Release 2.2. Then I protected the subordinate files with passwords. When I retrieved the main file, all the linking formulas returned ERR. How can I alter the linking formulas so that they'll return values from the protected files?

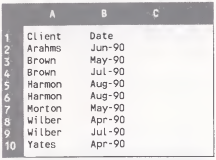
Cecilia A. Mulhollen
Paccar Government Group
Kirkland, Wash.

A A file that's already referenced in a linking formula in *1-2-3* Release 2.2 or *Symphony* Release 2.2 cannot be protected with a password. If you remove password protection from the six subordinate files, the linking formulas will return the values from those files the next time you retrieve the main file. For more information on linking files, refer to "Cell Mates" on page 74 of the July issue.

Tricky Data Query

Q Our social service agency produces a monthly report showing each client served and the month of service. We combine this report into a year-to-date worksheet and sort the list by client and date of service. Each month we'd like to see which clients have not received service in the previous three months.

For example, the following illustration shows part of the database from the end of August. Yates and Morton were served in April and May, respectively, but not after those dates. Each of the other clients was served in June, July, or August. What commands can extract the appropriate records?



	A	B	C
1	Client	Date	
2	Arahms	Jun-90	
3	Brown	May-90	
4	Brown	Jul-90	
5	Harmon	Aug-90	
6	Harmon	Aug-90	
7	Morton	May-90	
8	Wilber	Apr-90	
9	Wilber	Jul-90	
10	Yates	Apr-90	

Robert G. Toone
New York State Association
for Retarded Children
Buffalo, N.Y.

A This is a tricky database query. You must perform two database operations using two different sets of criteria.

The first database operation extracts from the database the records of clients served in the past three months. Those records become the criteria for a second operation, which deletes from the database every record that contains an extracted name. This leaves behind the records of the clients who weren't served in the past three months. Unfortunately, it also alters your database, but we'll deal with that in a moment.

To follow this discussion, start in a blank worksheet and enter the labels shown in row 1 and column A of the preceding figure. Use the @DATE formula to enter the dates in column B. Enter each date as the first of the month. For example, enter @DATE(90,6,1) into cell B2. Format the dates by selecting /Range (in *Symphony*, MENU) Format Date 3 and indicating range B2..B10. Copy cell B1 to cell A13 and cell A1 to cell A16. Then enter the formula +B2>=@DATE(90,6,1) into cell A14.

To specify the database ranges, select /Data Query Input (in a *Symphony* SHEET window, select MENU Query Settings Basic Database) and indicate range A1..B10. Then select Criterion and indicate range A13..A14. Select Output and indicate cell A16. Select Extract Quit (in *Symphony*, Quit Quit Extract Quit). Range A17..A21 contains a list of the clients who were served in the past three months.

Save the worksheet! You're going to use the Data Query Delete (in *Symphony*, Query Delete) command, which permanently erases records from the database, so make sure there's a copy of this worksheet stored on disk. You may want to save a second copy of the worksheet under a new name. By saving the file with a new name you prevent someone from accidentally saving the modified worksheet in place of the original.

After you save the file, reassign the Criterion range. Move the cell pointer to cell A16. Select /Data Query Criterion (in *Symphony*, MENU Query Settings Basic Criterion) and press Backspace to clear the existing range. Then press the period, End, DownArrow, and Return keys—in that order.

The Compiler for Lotus 1-2-3 v2.2

King Jaguar 2.2 supports **all** Lotus 1-2-3® (1.0A, 2.01, 2.2) macros and fomulas. In addition, the following features make the new King Jaguar the obvious choice when choosing a compiler:

- **Speed** Compiled applications run much faster than they do in 1-2-3.
- **Security** Formulas and macros are protected and concealed from end users.
- **Stand-alone** End users run your applications the same way but do not need 1-2-3
- **EMS & Virtual Memory Support** Run larger than usual applications. If RAM runs out, expanded memory is used, then hard disk space.
- **Customized Look and Feel** Assign colors to each screen element, create pulldown menus, and much more.
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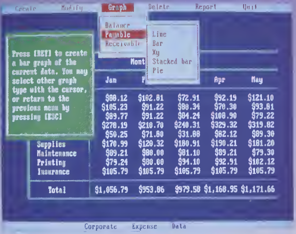
- **Debugger** Watch you macros and formulas execute at a speed you determine.
- **Sideways & Graph Printing** Print reports sideways and graphs from within your application.


Create
Modify
Graph
Delete
Report
Quit
Balance
Payable
Receivable
Line
Bar
Xy
Stacked bar
Pie
Press [RET] to create a bar graph of the current data. You may select other graph type with the cursor, or return to the previous menu by pressing [ESC]
Mont
Jan
Apr
May
$88.12 $102.81 $72.91 $92.19 $121.10
$105.23 $91.22 $80.34 $70.30 $93.81
$89.77 $91.22 $84.24 $108.90 $79.22
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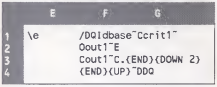
CIRCLE 111 ON READER SERVICE CARD

Next, select Delete Delete Quit (in *Symphony,* Quit Quit Delete Yes Quit). The database shrinks to the records of Morton and Yates, the only clients who weren't served in the past three months.

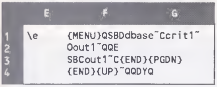
Don't save the worksheet without assigning a name other than the one used on your original year-to-date file. To preserve the list of clients not served in the past three months, either print out the worksheet or use the File Xtract command to create a separate file containing only these client names. When you wish to continue working with the original year-to-date worksheet, simply retrieve it.

If you want to speed up the two database operations, try the macro shown in the following worksheet:



```
        E          F           G
1   \e         /DQIdbase~Ccrit1~
2              Oout1~E
3              Cout1~C.{END}{DOWN 2}
4              {END}{UP}~DDQ
```

The *Symphony* equivalent follows:



```
        E          F           G
1   \e       {MENU}QSBDdbase~Ccrit1~
2            Oout1~QQE
3            SBCout1~C{END}{PGDN}
4            {END}{UP}~QQDYQ
```

Enter the labels shown for the spreadsheet product you're using. Begin the entry in cell E1 with an apostrophe label prefix. If you're using *1-2-3,* you must also begin the entry in cell F1 with a label prefix. Use the Range Name Create command to assign the following range names:

Name	**Range**
dbase	A1..B10
crit1	A13..A14
out1	A16
\e	F1

To isolate the names of clients who haven't received service in the past three months, hold down the MACRO key (Alt on most computers) and press E. Remember. Do not save the worksheet after you run the macro.

Remove password protection

Q When saving files, I use passwords to protect them from unauthorized access. How can I remove the password protection?

Sanjay Jain
Rowley, Mass.

A When you select /File Save (in *Symphony,* SERVICES File Save) and type a file name, you have the option of pressing the Spacebar and typing the letter P. When you do this, the software prompts you to enter a password. A password can be up to 15 characters long and is case sensitive. To make sure you've entered the password correctly, the software prompts you to enter it a second time. Remember the password, or write it down and keep it safe. If you forget a file's password, you cannot retrieve the file.

To remove password protection from a file you have retrieved, select /File Save (in *Symphony,* SERVICES File Save) and press the Backspace or Delete key to delete the characters *[PASSWORD PROTECTED]* that appear next to the file name. Then press Return and select Replace (in *Symphony,* Yes) to save the file without the password.

REVISITED

Retrieve files fast

In the February issue, page 69, you provided Kevin Pyle with a macro that would allow him to highlight a file's name to retrieve that file.

Why not use the NAME key instead? When you select /File Retrieve and press NAME, *1-2-3* displays a full-screen list of all the file names in the current directory. You can select a file to retrieve by moving the cell pointer from name to name. *1-2-3* also displays information about each file, such as the date and time the file was last saved and the file size.

It seems like extra work to write a macro when this feature exists in the product.

Philip Schwartzberg
Kibbutz Urim
Doar Na, Negev
Israel

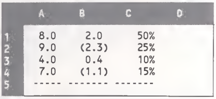
The editor replies: Using the NAME key to display a list of available file names is a handy trick. *Symphony* users can press the MENU or the SERVICES key to produce a similar full-screen list of file names.

We didn't discuss the NAME key in our original response because Kevin Pyle stated that he wanted to be able to move the cell pointer around within a list of file names that he stored in a worksheet. Certainly, anyone retrieving a spreadsheet file will benefit from learning how to use the NAME key in conjunction with the File Retrieve command.

Right-aligned underlines

In the November issue, page 90, Kim Bussy noted that the quotation mark label prefix doesn't align a label with the right edge of a cell. Instead, it leaves a space between the end of the label and the cell's right boundary.

I use a formula to automatically generate an underline that begins one character from the left edge of a cell and extends to the right edge. For example, enter the values shown in range A1..C4 of the following figure. Then assign to range A1..B4 the , (Comma) (in *Symphony,* Punctuated) format with one decimal place and to range C1..C4 the Percent (in *Symphony,* %) format with zero decimal places.



```
       A        B        C        D
1     8.0      2.0      50%
2     9.0     (2.3)     25%
3     4.0      0.4      10%
4     7.0     (1.1)     15%
5    ----- ------- -------
```

Then enter the following formula in cell A5 and copy cell A5 to range B5..C5:

```
+" "&@REPEAT("–",@CELL("width",
  A4..A4)–1)
```

The advantage of this formula is that if you change the width of a column, the length of the underline changes automatically when you recalculate the worksheet.

Kathleen Goeldner
Baxter Healthcare Corp.
El Paso, Tex.

The editor replies: Another advantage of the formula is that you can enter it once and copy it to the cells that you want to contain underlines. The underline generated by each formula will immediately reflect the width of the current column.

Calculate a commission

In the April issue, page 80, Bob Carr asked how to calculate a commission using a progressive-scale system. The scale is as follows:

- Up to $50,000 earns 12%
- Second $50,000 earns 9%
- Anything over $100,000 earns 7%

Although the formula we provided works, many readers found it too complex, and they suggested alternative formulas. Most people who responded suggested the following formula, or a variation of it, to calculate the commission of a value stored in cell A1:

```
@IF(A1>=100000,(A1–100000)*.07+
  10500,@IF(A1>50000,(A1–50000)*
  .09+6000,A1*.12))
```

The shortest formula submitted was:

```
+A1*.07+@MIN(100000,A1)*.02+@MIN
  (50000,A1)*.03
```

This formula capitalizes on the decrease in commission from one level of sales to the next. The formula's first expression, +A1*.07, accounts for the fact that any sale will receive at least a 7% commission.

The expression @MIN(100000,A1)*.02 adds a 2% commission to any sale below $100,000. The final expression, @MIN(50000,A1)*.03, adds another 3% commission to any sale less than $50,000.

Thanks to all of our readers who submitted simplified formulas. Robert A. Kelly of Florham Park, N.J., not only sent the first letter, but he came up with both formulas.

CONTEST

This month's contest asks readers to suggest a formula or formulas that can convert a value into a string in Comma format with zero decimal places. For example, if cell A1 contains the value 108108, the final formula should return the string 108,108. If you change the value in cell A1 to 108108108, the final formula should return 108,108,108.

This contest idea was submitted by Jacob Braun of Marine Midland Bank, New York, N.Y.

The first 25 people who submit what the *LOTUS* judges consider to be the best answer will receive a *LOTUS* Swiss Army knife.

Please send us a disk copy and a printed copy of your answer with appropriate documentation. All entries must be postmarked before midnight, Aug. 31, 1990. Winners will be announced in the November issue. Mail your answers to **August Contest**, *LOTUS* Magazine, P.O. Box 9123, Cambridge, MA 02139-9123.

Submit contest ideas to Q&A Contest Idea, *LOTUS* Magazine, P.O. Box 9123, Cambridge, MA 02139-9123. Include your solution, documented with appropriate comments. We'll pay $200 if we use your contest idea accompanied by a proven solution, $25 if we use your idea unaccompanied by a solution.

This material was prepared by Daniel Gasteiger and the Technical Editors.

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CIRCLE 112 ON READER SERVICE CARD

More Tips on Using Lotus Products

OPERATING SYSTEMS

DOS SORT command

The DOS SORT command is a valuable but often overlooked command. For example, you can use it in conjunction with the DOS DIR command to get a sorted listing of a directory or subdirectory. Below are some examples that you enter at the DOS prompt:

Command	***Purpose***
DIR¦SORT/R	Sorts in reverse order
DIR¦SORT/+0	Sorts by file name
DIR¦SORT/+10	Sorts by file extension
DIR¦SORT/+14	Sorts by file size
DIR¦SORT/+22	Sorts by date
DIR¦SORT/+32	Sorts by time

Jill Barnhart
Owego, N.Y.

The default SORT command order in DOS is ascending order by file name with numbers first. The DOS SORT command can have two parameters: /R and /+*n*. The /R parameter instructs DOS to sort in descending order. The /+*n* parameter instructs DOS to start sorting with column *n*, where *n* is an integer representing the character position in a line.

In a directory listing, characters 1 through 8 on each line are the file name, characters 10 through 12 are the file extension, and so on. The following figure is a partial directory listing of a disk in drive A:

```
ASSIGN    COM      1536  12-30-85  12:00p
ATTRIB    EXE      8247  12-30-85  12:00p
BACKUP    COM      6234  12-30-85  12:00p
BASIC     COM     19298   2-21-86  12:00p
BASICA    COM     36396   2-21-86  12:00p
CHKDSK    COM      9832  12-30-85  12:00p
COMP      COM      4184  12-30-85  12:00p
DISKCOMP  COM      5792  12-30-85  12:00p
DISKCOPY  COM      6224  12-30-85  12:00p
EDLIN     COM      7508  12-30-85  12:00p
```

To get a screen listing of the files in drive A sorted in ascending order by the first character of the extension, use the following command at the DOS prompt:

```
DIR A:¦SORT/+10
```

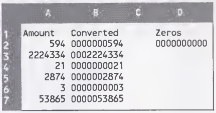
Although these examples of the SORT command work, you can use different position numbers. For example, to sort by file extension, you can also enter the following command:

```
DIR A:¦SORT/+9
```

1-2-3 / SYMPHONY

Creating leading zeros

To load my spreadsheet onto the mainframe, I have to convert it to 80-column format. The dollar amounts must be 10-character labels and must be zero-filled to the left. For example, in the following worksheet, column A contains the figures that need to be loaded onto the mainframe, column B contains the converted data, and cell D2 is a range named *zeros*, which contains 10 zeros.



	A	B	C	D
1	Amount	Converted		Zeros
2	594	0000000594		0000000000
3	2224334	0002224334		
4	21	0000000021		
5	2874	0000002874		
6	3	0000000003		
7	53865	0000053865		

Enter the labels in range A1..D1. Enter a label made up of 10 zeros in cell D2, and assign the range name *zeros* to cell D2. Enter the values in range A2..A7. Then enter the following formula into cell B2, and copy it down the column as needed:

```
@REPLACE($zeros,10–@LENGTH
  (@STRING(A2,0)),@LENGTH
  (@STRING(A2,0)),@STRING
  (A2,0))
```

This formula determines the length of the value in cell A2 and adds enough zeros to the left to bring the total character count to 10.

Dwight White
Anchorage, Alaska

1-2-3

Keyboard problems using 386Max

On some computers, running *1-2-3* Release 3 with *386Max Professional* version 4.07 (a memory manager for 80386- and 80486-based PCs) may create various keyboard problems. For example, the NumberLock key may be automatically activated, or there may be unexpected beeps and keystrokes.

Only *386Max Professional* versions 4.03, 4.05, and 4.08 work with *1-2-3* Release 3. If you have keyboard problems, upgrade to version 4.08. This version eliminates such conflicts. To upgrade, call the manufacturer, Qualitas, at (301) 469-8848.

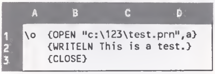
Arthur Souza
Product Support Dept
Lotus Development Corp

386Max Professional frees conventional memory (memory up to 640K) by moving device drivers, pop-up utilities, and TSR (terminate-and-stay-resident) programs into memory mapped in the unused addresses between 640K and 1 Mb.

Append with {OPEN} command

You can append information to an ASCII file using a *1-2-3* Release 2.*x* or Release 3 macro without deleting information already in the ASCII file. Use the {OPEN} macro command and the *a* parameter to append data to the end of an existing file. The syntax for the command is {OPEN *filename*,a} where *filename* is the name of the ASCII file to which you want to add more lines.

In the following macro, named \o, the {OPEN} command opens the ASCII file named TEST.PRN and adds the statement *This is a test.* The {CLOSE} command closes the ASCII file.



```
     A      B            C            D
1  \o   {OPEN "c:\123\test.prn",a}
2       {WRITELN This is a test.}
3       {CLOSE}
```

Alison Jahrsdoerfer
Product Support Dept.
Lotus Development Corp.

Editing a range name

Did you know that you can edit a range name even before you have finished creating the range? When you select /Range Name Create, *1-2-3* prompts you for the range name. After you enter the name, *1-2-3* asks you to specify the range. Suppose that you notice at this point that the range name is misspelled. Highlight the range. Then, instead of pressing the Return key, press the EDIT key. The cursor moves back to the range name, allowing you to reenter it. Then press Return to name the range.

Glenn Winford
Cordova, Tenn.

This works only in Releases 2.01 and 2.2.

Macro compatibility

If you invoke a *1-2-3* Release 3 macro that includes a /XN or /XL command and you get the error message *Invalid string argument*, check for a semicolon or any arithmetic operator (+, –, *, /, ^) within the prompt string. For example, the following macros will work in every release of *1-2-3* except Release 3:

```
/XNEnter cost/revenue ratio:
~cost_rev~

/XLEnter name; use today's
code:~name~
```

Release 3 tries to calculate a result from the macro command. If you must use one of these characters in Release 3, use the advanced macro commands {GETNUMBER} or {GETLABEL}:

```
{GETNUMBER "Enter cost/revenue
ratio: ",cost_rev}~

{GETLABEL "Enter name; use
today's code: ",name}~
```

Glenn McDonald
Product Support Dept
Lotus Development Corp.

Legends not absolute

When you insert or delete rows or columns in *1-2-3* Releases 2.01 and 2.2, cell addresses of items below or to the right of the insertion or deletion change. If you use a cell address to assign a graph legend and the cell address changes, your graph will display the wrong legend.

Instead of using a cell address to assign a legend, use a range name. For example, if the legend for data-range A is in cell E3, use the Range Name Create command to name cell E3 *alegend*. When the program prompts you for the A-range legend, enter \alegend. *1-2-3* Release 3 automatically adjusts range references when you insert or delete rows or columns.

Eddie English
Product Support Dept.
Lotus Development Corp

End of header prints on next line

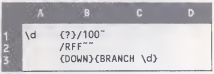
A customer had problems printing headers on his Epson FX80. The right-aligned header didn't extend to the right margin, which he set at 136, yet part of it wrapped to the line below.

The problem was in the right margin setting. The Epson FX80 does not accept more than 132 characters of compressed print per line. If you are having this problem, reset the right margin to 132 (or to 76 in *1-2-3* Release 3 if you selected /Print Printer Options Advanced Layout Pitch Compressed).

Glenn McDonald
Product Support Dept.
Lotus Development Corp

Decimal points automatically placed in entry

The accountants in my office are accustomed to using calculators that automatically place the last two digits they enter after the decimal point. They use the following *1-2-3* macro to simulate these calculators when they enter columns of numbers into their spreadsheets:



```
     A        B            C          D
1  \d     {?}/100~
2         /RFF~~
3         {DOWN}{BRANCH \d}
```

Use the Range Name Create command to assign the name \d to cell B2. To start the macro, place the cell pointer in a blank cell, hold down the MACRO key (Alt on most computers), and press D. The macro waits for you to enter a number, divides that number by 100, and assigns the Fixed format with two decimal places to the cell. The macro then moves the cell pointer down to the next cell and waits for you to enter the next number.

To stop the macro, hold down the Control key and press Break, then press the Escape key to clear the error.

Tom Warrner
InfoSource Inc
Maitland, Fla.

SYMPHONY

Uppercase/ lowercase toggle

I use *Symphony* Release 2.0 and have discovered a handy tool to convert uppercase text in a DOC window to lowercase, and vice versa.

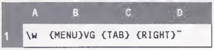
For example, if you want to change the word *unbelievable* to all uppercase characters, position the cursor on the *u*, hold down the Control key, and press X. The character *u* now appears as *U*. The cursor automatically moves to the *n*. Continue converting the characters to uppercase by pressing Control-X. The word now appears as *UNBELIEVABLE*.

Douglas W Phillips
Williams College
Williamstown, Mass

In *Symphony* Release 1.2, press Control-C instead of Control-X.

Speedier spell checking

Generally, I like *Symphony*'s spelling checker. It does things that other spelling checkers don't do, such as check for capital letters at the beginning of sentences. But sometimes I want to check the spelling of just one word. Unfortunately, this requires many keystrokes. To get around this, I wrote a simple macro to spell-check the word the cursor is on. Notice that there is a single space before and after the {TAB} command.



```
     A       B          C        D
1  \W  {MENU}VG {TAB} {RIGHT}~
```

To run this macro, you must be in a DOC window and the spelling checker add-in must be loaded. Hold down the MACRO key (Alt on most computers) and press W. The macro selects MENU Verify Go, presses the Spacebar to expand the highlight to the space at the end of the current word, and presses the Tab key to move the pointer to the beginning of the highlighted word. It then presses the Spacebar to expand the highlight to the space in front of the word. The {RIGHT} command presses RightArrow once to exclude the space, presses Return to accept the highlighted word, and performs the spelling check.

If the pointer is on the space between two words, this macro will spell-check both words.

Larry B Hatton
Questar Service Corp
Salt Lake City, Utah

This macro works in *Symphony* Release 1.2 but not in Release 2.0. To run the macro in Release 2.0, change the command in cell B1 to read:

```
{MENU}VG ~
```

The cell pointer must be on the first letter of the word that you want to spell-check In Release 2.0, the macro doesn't work when the cell pointer is between words.

HARDWARE

Release 3 on NEC Prospeed laptop

I installed *1-2-3* Release 3 on my NEC Prospeed 286 laptop using different display configurations, but I was unable to get *1-2-3* to display on the LCD screen. The Access menu and the licensing screen displayed, but the *1-2-3* worksheet appeared as a blank screen.

I experimented with an external monitor and found that the problem is in the NEC's display mode. The NEC Prospeed 286 operates in one of three display modes: color, black and white, or monochrome.

1-2-3 Release 3 works with two of the three modes. It runs in black and white using the 80-by-25 monochrome VGA driver. You must add the following DOS MODE command to the batch file that loads *1-2-3*:

```
mode bw80
```

1-2-3 also displays in various shades of gray using the 80-by-25 color VGA driver. Add the following DOS MODE command to the batch file that loads *1-2-3*:

```
mode co80
```

Jeff Cropp
Wilton, Conn

The MODE command is an external DOS command. This means that the MODE.COM file must be in the subdirectory that loads *1-2-3* or in a subdirectory listed in the DOS PATH command. If you don't use a batch file to load *1-2-3*, you can execute a MODE command by entering it at the DOS prompt.

REVISITED

Retaining numeric formats in print file

I realize that you must edit the letters you receive before you print them in Good Ideas. But one small change in my letter in the September issue [page 100]—substitution of the word *document* for *merge*—slightly distorted the discussion about translating and converting the file.

In *WordPerfect*, a mail-merge file and a document have totally different formats. Each column in a mail-merge file represents a field, which must be separated from the next field by ^R. Therefore, when you convert a *1-2-3* file into a *WordPerfect* mail-merge file, you must retain the column format. First, use *1-2-3*'s Translate utility to convert the file to DIF format. Then, use *WordPerfect*'s Convert program to create a secondary file in which each field is followed by ^R and each record is separated with ^E.

Anita L. Newton
Mesa, Ariz.

We apologize for our mistake.

Stopping an autoexecuting macro

Like Steven Huelskoetter [March, page 99], I've had problems stopping an autoexecuting macro before it begins. I've tried to stop the macro by holding down the Control key and pressing the Break key, but I'm not always successful. The timing has to be just right. Mr. Huelskoetter found that he could freeze the macro by invoking the Step mode before retrieving the worksheet. I've found another way: the File Combine command.

Begin in a blank worksheet, select /File Combine Copy, and specify the name of the file that contains the macro. In *Symphony* select SERVICES File Combine Copy Entire-File Read Formulas, then specify the file name. This method combines the file with a blank worksheet and eliminates the range names in the file, thereby disabling the autoexecuting macro.

Myron Truex
Motorola Inc
Sacramento, Calif.

This material was prepared by the Technical Editors, with the help of the Lotus Product Support staff.

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Release 3 Treasure Hunt: Part 1

The less flashy features are often the most useful.

BY DAVID J. BOOKBINDER

Whenever you upgrade to a new release, the long-awaited, much-touted features get your immediate attention. But by now, using the multiple-worksheet, multiple-file, and external-database features of *1-2-3* Release 3 may be second nature. If so, explore this trove of humble new features and improvements to old, familiar commands that make the program a pleasure to use.

Among Release 3's new features are Undo, the search and replace feature, more formatting options, and additional uses for familiar function keys. Once you try them, you'll wonder how you ever got along without them.

Undo: Oops Insurance

Have you ever accidentally typed a value over a formula, copied a range onto data you wanted to keep, or performed some other spreadsheet task that you immediately regretted? If so, you need the UNDO key, which restores the worksheet to its previous condition.

Release 3 can undo any change to the worksheet or to the *1-2-3* environment that can be saved to a worksheet file. Examples include changes to data, worksheet settings, range names, and temporary defaults, such as the start, step, and stop values specified as part of a Data Fill command.

Release 3 cannot undo tasks such as saving or deleting a file, recalculating a worksheet, printing a file, storing a global default setting, or executing a DOS command. It cannot undo operations that don't change the worksheet file. Examples of these tasks include moving the cell pointer, pressing the HELP key (F1 on most computers), or selecting /Worksheet Status or /File List Active. If you press UNDO after performing one of these tasks, Release 3 undoes the last "undoable" operation you performed—whatever that operation might have been.

MOTION PICTURE AND TELEVISION PHOTO ARCHIVES

The UNDO key can be enabled for a single work session or every time you start *1-2-3*. To turn the Undo feature on, select /Worksheet Global Default Other Undo Enable. Then, if you want to use it for the current session only, select Quit. If you want to use it for all future work sessions, select Update Quit. To turn Undo off during a work session, select /Worksheet Global Default Other Undo Disable Quit.

To undo the effects of an undoable operation, hold down Alt and press the F4 key from Ready mode. Release 3 displays the choices Yes and No. Select Yes to restore the worksheet to its previous state. Select No to return the worksheet to Ready mode without making any changes.

Before Release 3 makes any changes to the worksheet, it stores the current version in what is known as an Undo record. In other words, before Release 3 enters new data in a cell, it tucks away the cell's current contents. Then, when you press the UNDO key, Release 3 finds the cell's previous contents in the Undo record.

As always, there are a few cautions. First, the UNDO key works from Ready mode to Ready mode. That means if you start in Ready mode, make several menu selections that change the worksheet, return to Ready mode, and press UNDO, Release 3 undoes *all* the changes caused by that set of menu selections. For example, if you select /Graph, create several graphs without leaving the Graph menu, and then press the UNDO key, Release 3 undoes *all* the graph settings. Similarly, if you run a macro and then press UNDO, Release 3 restores the worksheet to the state it was in just prior to running the macro.

Second, because Release 3 creates an Undo record just before making a change to the worksheet, pressing the UNDO key undoes any partially completed command that changes worksheet settings. For example, suppose you copy a range, select /Data Fill, specify a Fill range, and then decide that you want to undo the Copy command. If you press the Escape key to back out of the Data Fill command and then press UNDO, Release 3 undoes the Fill range setting, instead of the Copy command.

Third, the Undo feature is one level, meaning that you can only undo the most recent undoable operation. Also, the UNDO key is not a toggle. Pressing UNDO twice does not undo the undo.

Search and Replace

Scanning hundreds or thousands of cells for every occurrence of a particular label, value, or formula has always been tedious. But now, the Range Search command makes it a snap to find or change every occurrence of a character string.

The Range Search command is akin to the search and search-and-replace commands found in most word processors. Select /Range Search, and Release 3 prompts you for a search range and a search string. After entering that information, specify whether *1-2-3* should search labels, formulas, or both. Then Release 3 offers two choices: Find and Replace.

If you select Find, Release 3 highlights the first occurrence of the string and lets you choose to continue or quit the search. If you select Replace, Release 3 prompts you for a replacement string. As Release 3 highlights each occurrence of the string, you can elect to replace the string that's highlighted, replace all matching strings in the range, skip to the next iteration, or quit the search altogether.

You can also use the Range Search command rather than using the GOTO key (F5 on most computers) or the pointer-movement keys. For example, suppose you want to move the cell pointer to the database record containing information on Mark Gordon, but you're just not sure which sheet in a multiple-sheet file contains that data. Select /Range Search and specify a search range that includes all of the sheets. Press Control-Home to move the pointer to cell A:A1, press the Tab key to anchor the pointer, press End, press Control-Home to move the pointer to the lower-right corner of the file's active area, and press Return. Specify *Mark Gordon* as a search string and specify that Release 3 should search only labels. Finally, select Find. When Release 3 locates the record, select Quit.

One point to bear in mind: Release 3 searches hidden cells but doesn't search hidden columns or worksheets.

Easier Formatting

Release 3 offers four new cell formats: Automatic, Label, Parentheses, and Color Negative.

The Automatic format lets Release 3 assign a format to a cell as you enter data into it. That means that if you enter a number that looks like it's in Comma, Currency, Fixed, Percent, or Scientific format, or most Date and Time formats, Release 3 automatically assigns the appropriate format to the cell.

Let's try the Automatic format. Select /Range Format Other Automatic and specify range A1..A10. When you enter data in the cell, *1-2-3* assigns an appropriate format to it. Move the cell pointer to cell A1 and look at the control panel, where Release 3 displays *(A)*, indicating Automatic format. Now enter *$100.00* in cell A1. Type this value exactly as shown, including the dollar sign and decimal point. Release 3 displays the value just as you entered it, and the control panel displays *(C2)*, indicating Currency format with 2 decimal places.

Enter *300* in cell A1. Release 3 displays it in Currency format with 2 decimal places. Once you enter data into an automatically formatted cell, it behaves exactly like a manually formatted cell.

The Automatic format nicely handles cell entries that begin with numbers but also contain spaces or other nonnumeric characters. Enter the label *58 Kettering Drive* in cell A2. *1-2-3* automatically converts the entry to a label and assigns the Label format, another new Release 3 format, to the cell.

The Label format is invaluable when you enter data that consists primarily of text but also contains entries such as ZIP codes, street addresses, and telephone numbers that you want to store as labels. Normally you precede these entries with a label prefix to prevent *1-2-3* from trying to interpret them as values. Select /Range Format Other Label to assign the Label format to range D1..D10. In this range, enter a few labels that start with values. Release 3 adds the label prefix for you. When the pointer is in a cell formatted for labels, the control panel displays *(L)*.

The Parentheses and Color Negative formats manage displays of numbers. To surround all the numbers in a range with parentheses, select /Range Format Other Parentheses Yes and specify a range. This format is conventionally used for negative values. When the pointer is on a cell formatted for parentheses, Release 3 displays *(())* in the control panel.

To call attention to negative values, try the Color Negative format, which displays negative numbers in a brighter intensity on a monochrome monitor or in a different color on a color monitor. Select /Range Format Other Color Negative and specify a range. *1-2-3* highlights the negative values in the range. When the cell pointer is in a cell with the Color Negative format, the control panel displays *(−)*.

New Uses for Old Keys

In Release 3, the NAME key has a few more uses. It is also handy when the worksheet is in Point mode. For example, type *@SUM(*, press the NAME key, and Release 3 displays a list of the named ranges. Highlight the range name of the data you want to sum and press Return. Release 3 inserts the range name in the formula. Type a close parenthesis and press Return to complete the formula.

The NAME key helps you build formulas and macros. Type an at sign (@) and press the NAME key twice. Release 3 displays a screenful of @functions. Press PageDown to view a second screenful. Move the pointer to the desired @function, press Return, and Release 3 enters the @function and an open parenthesis on the command line. Similarly, type an open brace ({) and press the NAME key twice. Release 3 displays a list of macro commands and key words. Press PageDown to view a second screenful. Move the cell pointer to the desired macro command or key word, press Return, and Release 3 enters it on the command line.

A beefed-up HELP key provides better formula and macro help. If you type only an at sign or open brace and press HELP, Release 3 displays an index of @functions or macro key words. If you've already typed the name of an @function or a macro key word, Release 3 displays help on that function or key word.

Unsure about the name or syntax of an @function or macro key word? Use a combination of the NAME and HELP keys. For example, suppose you need to convert a time stored as a label to a value. Some @function does that, but which one is it? Type an at sign, press the NAME key twice, and press the PageDown key to see the @functions that deal with time. The one called TIMEVALUE sounds like it might do the job. Move the cell pointer to TIMEVALUE and press Return. Release 3 enters the characters *TIMEVALUE(* on the command line. Press HELP and a screen explaining the use and syntax of the @TIMEVALUE function appears.

The Hunt Continues

October's installment of this column will explore another collection of hidden Release 3 features. These include automatic date- and time-entry formats, worksheet annotation, automatic keystroke-and-command recording, and worksheet maps, to name a few.

David J. Bookbinder is a free-lance writer and author of *The Lotus Guide to 1-2-3 Release 3*.

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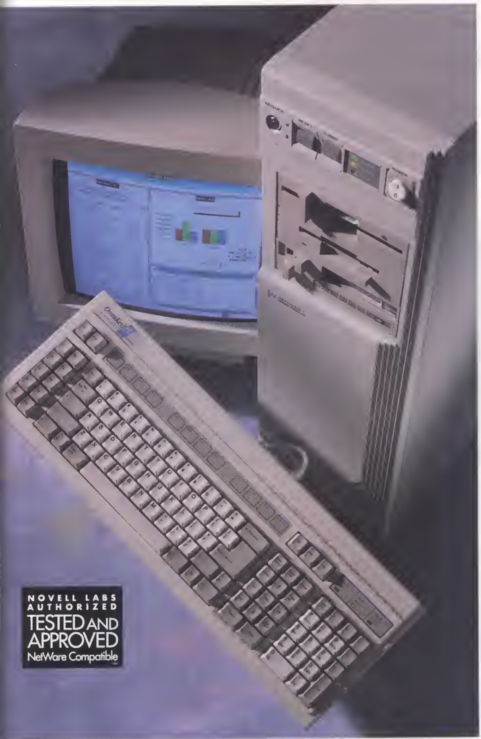

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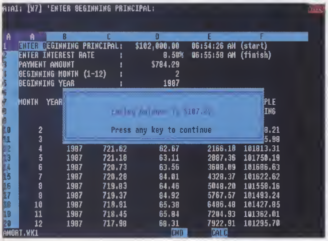
CIRCLE 125 ON READER SERVICE CARD

A Programming Language for 1-2-3 Release 3

The Lotus Add-In Toolkit for Release 3 brings new functionality and ease of use to worksheet applications.

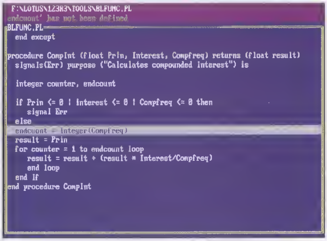
BY BILL LAWRENCE



```
A:A1: [W7] 'ENTER BEGINNING PRINCIPAL:

A    A       B           C            D            E           F
1   ENTER BEGINNING PRINCIPAL:   $102,000.00   06:54:26 AM (start)
2   ENTER INTEREST RATE      :         8.50%   06:55:58 AM (finish)
3   PAYMENT AMOUNT           :       $784.29
4   BEGINNING MONTH (1-12)   :             2
5   BEGINNING YEAR           :          1987
6
7   MONTH   YEAR                                                PLE
8                   [illegible]                                 ING
9
10      2           Press any key to continue                  8.21
11      3                                                      5.98
12      4     1987     721.62        62.67      2166.18   101813.31
13      5     1987     721.18        63.11      2887.36   101750.19
14      6     1987     720.73        63.56      3608.09   101686.63
15      7     1987     720.28        84.01      4328.37   101622.62
16      8     1987     719.83        64.46      5048.20   101558.16
17      8     1987     719.37        84.92      5767.57   101493.24
18     10     1987     718.81        65.38      6486.48   101427.85
19     11     1987     718.45        65.84      7204.93   101362.01
20     12     1987     717.98        68.31      7922.91   101295.70
AMORT.WK1                            CMD     CALC
```

FIGURE 1. With Toolkit you can create informative pop-up windows in your programs. The window in this mortgage-amortization worksheet shows the final balance due on the loan—and prevents the user from having to scroll to the last row of the worksheet during what-if testing.



```
 F:\LOTUS\123R3\TOOLS\BLFUNC.PL
endcuont' has not been defined
BLFUNC.PL
  end except

procedure CompInt (float Prin, Interest, Compfreq) returns (float result)
  signals(Err) purpose ("Calculates compounded interest") is

  integer counter, endcount

  if Prin <= 0 | interest <= 0 | Compfreq <= 0 then
     signal Err
  else
  endcuont = Integer(Compfreq)
  result = Prin
  for counter = 1 to endcount loop
     result = result + (result * Interest/Compfreq)
     end loop
  end If
end procedure CompInt
```

FIGURE 2. When you run Toolkit's compiler from within its editor, program errors are highlighted along with the resulting compiler error message. After you fix the error, the compiler recompiles the program until it finds the next error.

Make no mistake about it: The Lotus Add-In Toolkit for Release 3 is not for everybody. It's specifically designed for macro experts who need to create Release 3 worksheet applications but who have outgrown *1-2-3*'s macro language. And this relatively small target audience can be narrowed further—you need OS/2 to get the most from Toolkit.

If you're still reading, then Toolkit ($395) may be for you. With it, you can fortify or replace your existing worksheet applications with custom add-in @functions, macro commands, and data-entry forms. Or you can create complete add-in applications that extract, process, and rewrite worksheet data.

Toolkit takes some work to learn, even if you're a macro guru. But you don't have to learn everything about Toolkit before realizing some of its benefits. For example, you can use Toolkit to create menus that invoke your macros before you learn how to replace those macros with Toolkit programs. Or you can add pop-up help screens to an otherwise unchanged worksheet template.

Toolkit, however, is not Release 3's answer to the assembly-language Lotus Developer Tools ($150), used to create add-ins for *1-2-3* Release 2.*x* and all *Symphony* releases. To its credit, Toolkit is a lot easier to use than Developer Tools and provides more ways to customize and optimize worksheet applications. But unlike the Developer Tools, Toolkit can't help you perform customization outside of the worksheet. For example, it doesn't let you create custom graph types or manage *1-2-3*'s use of your computer's memory.

A New Language

The heart of Toolkit is the Lotus Programming Language (LPL), which is comparable to such widely used programming languages as C and Pascal. In fact, LPL is easier to learn if you've worked with C, Pascal, BASIC, or PC database languages, such as *dBase* and the Paradox Application Language (PAL).

Macro experts will appreciate the chapter in Toolkit's documentation that compares some *1-2-3* macros with their LPL equivalents. Unfortunately, if you follow the reading path suggested in the documentation, you're likely to become confused and distracted long before you reach this chapter. In fact, the instructions would have you read almost eight chapters of the weighty *LPL Reference Manual* before you reach a line of familiar macro code. Rather than doing that, after reading the Quick Start section, move to the *Library Reference Manual*. This manual's first chapter instructs you to read only three chapters of the *LPL Reference Manual* and then work through the examples in the "Starting to Write Add-Ins" chapter. Next come the LPL-to-macro comparisons. Once you work through these, you're ready to create custom @functions and macro commands.

Once learned, LPL is much more convenient to use than *1-2-3*'s macro language. LPL's syntax is more intuitive—that is, more like English. If, for example, you want to create a program that sets the column width in a range called *totals* to 15, the appropriate *1-2-3* macro looks like this:

```
/WCCSTOTALS~15~
```

The corresponding LPL command looks like this:

```
TOTALS.WIDTH=15
```

LPL also makes it easier to reuse portions of a program you've already written. To move macro code from one file to another, you need to use *1-2-3*'s File Combine command. With LPL you can store frequently used code in a file and reuse the code simply by referencing that file's name in any LPL program.

Speed and Functionality

Usually, LPL programs run faster than their macro counterparts. They run significantly faster when they take advantage of certain LPL features that let you process data in memory rather than in the worksheet. For example, LPL really speeds up looping calculations because it lets you store your variables in memory. In my tests, a macro that loops 365 times to calculate a year's interest compounded daily took 8 seconds to run. An LPL @function, using the same logic, did the work in 2 seconds.

✓ ✓ ✓

TOOLKIT PROGRAMS USUALLY RUN FASTER THAN THEIR MACRO COUNTERPARTS.

LPL also lets you create arrays in memory that provide a faster alternative to look-up tables. And the language's IF and THEN commands, which also process data in memory, can even speed conditional procedures, such as complex menu structures.

LPL programs deliver less-pronounced gains in speed when performing worksheet-based operations. For example, a macro that created two large ranges, copied the contents of the first range into the second, formatted the second range as currency, set its column widths to 15, and then repeated the entire process twice took 7 seconds to execute these tasks. An LPL program did the same work in 5 seconds.

The real power of Toolkit lies in its Application Data Types (ADTs), which are special program files that you can reference in your LPL programs. Some ADTs add functionality that would be difficult or impossible to duplicate with macros. One, called Window, lets you create informative windows that can pop up anywhere on-screen (see figure 1). Another, called Input, lets you create menu-driven data-entry forms, which come complete with help screens and data-validation functions.

Other ADTs are prewritten data types—programming routines that let you describe, manipulate, and process data as a cell, range, worksheet, or file. These ADTs make it easy to, say, describe a series of numbers—perhaps numbers that your program has calculated—as a formatted named range or as the contents of several worksheets in a 3-D file.

The Toolkit includes other prewritten routines that save a lot of work. There are routines that duplicate many of *1-2-3*'s @functions so that you can include these calculations in your programs without rewriting them yourself. Others let you create user prompts or *1-2-3*–style menus with just a few lines of code.

Compiling and Debugging

Once you've written a program, you use Toolkit's compiler to convert the LPL code into an add-in that can be run from within Release 3. During this conversion, the compiler finds and reports syntactical errors in your code, such as misspelled or improperly used commands. Most language compilers compile your entire program and create a list of all the syntactical errors, but Toolkit's compiler stops at the first error it finds. If you run the compiler from within Toolkit's editing screen, you can correct that error right away. However, after you correct the error, you have to restart the compiler, which starts compiling again from the beginning of your program. This takes lots of time, especially if you make several mistakes while first learning LPL.

Once compiled, your add-in may still contain execution errors. In other words, you may have used perfect LPL syntax to tell your program to do something it just can't do. Toolkit's debugger finds execution errors in your compiled add-in. It also helps you locate the cause of the error in your source code so that you can make corrections. As it works, the debug-

HELP FOR LPL PROGRAMMERS

A few resources are available to help you better understand and use Toolkit. For $120 per year, you can subscribe to *Technically Speaking: The Journal for Lotus Add-In Toolkit Users* from GreyMatter Publishing, Setauket, N.Y. This monthly newsletter discusses LPL programming techniques and documents programs that can be incorporated in your own add-ins. GreyMatter also sells *The Developer's Library* ($295), a program that contains almost 100 statistical, scientific, and mathematical functions that you can reference in your LPL programs.

Robert Ainsbury's *Lotus Add-In Toolkit Guide* (Que Corp., $22.95), published in May, provides a beginners guide to Toolkit. Those who want a more in-depth reference—and who have some experience in computer programming—should wait for this fall's release of *Inside the Lotus Add-In Toolkit: The Definitive Guide* (published by Brady Books, $24.95; $44.95 with applications disk). Written by Jeffrey Kahn, president of GreyMatter Publishing, and J. David McCall, one of the developers of Toolkit, this book includes hundreds of sample applications illustrating the use of every Application Data Type and Lotus Programming Language procedure.—*B. L.*

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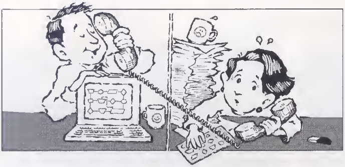

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✓ ✓ ✓

ger continually displays the status, or value, of your variables so that you can check to make sure your program is doing what you want it to do every step of the way. You can even set the debugger to pause at a particular point in the program or to pause if a particular condition occurs.

Unfortunately, the debugger runs only in OS/2. If you don't have OS/2, you have to debug by trial and error—that is, by repeatedly editing, recompiling, and running your add-in until you fix the problem. This is a tedious process.

If you've worked with other programming languages, Toolkit's lack of a linker may disappoint you. Languages such as C and Pascal can link the routines referenced in code to create a single program file. However, an LPL add-in requires a separate file for every ADT or prewritten routine referenced in the program. If you distribute your add-in, you have to distribute those files, too—and everyone who uses the add-in must make sure that those files don't have the same name as any of their other files. Also note that the more files you include with your add-in, the longer the add-in takes to load.

At present, you can't use Toolkit to write an add-in that marries Release 3 to another environment, such as the spreadsheet-publishing interface provided by *Allways* or the compressed-screen display in *SeeMore*. To do so, you'd have to write part of that add-in in another language and combine it with LPL code, which is something that the current version of Toolkit won't let you do. Help is coming, though. Sometime this fall Lotus plans to release a link between Toolkit and programs written in C. ■

Bill Lawrence is a network engineer based in Southern California and the author of *Using Novell NetWare* (Que Corp.).

IN BRIEF

Lotus Add-In Toolkit for Release 3 Version 1.0. Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; 617-577-8000. Runs on the IBM PC AT, PS/2 Model 50 or higher, and compatible 80286- or 80386-based computers. Requires DOS 3.0 or higher and 2 megabytes of RAM, or OS/2 version 1.1 or higher and 4 megabytes of RAM. Debugger requires OS/2 version 1.1 or higher. Released 9/89. $395.

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REVIEWS ✓ ✓ ✓

Blueprints for Business Success

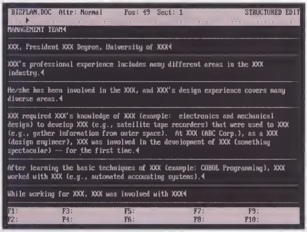
Polish your business plan with *BizPlanBuilder* and *Business Plan Toolkit.*

BY JIM KINLAN

Looking for money to start your own business? Before investors part with their money, they want to see a business plan that spells out your company's mission and demonstrates its potential financial strength. The trouble is that with all that's involved in getting a business off the ground, writing a formal business plan can easily fall to the bottom of your lengthy list of priorities.

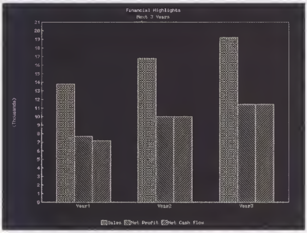
If you have a word processor that reads ASCII files and *1-2-3* (see In Brief box for releases) or a compatible spreadsheet program, *BizPlanBuilder* ($99) or *Business Plan Toolkit* ($99.95) can help you create a complete, enticing business plan. Both programs include prewritten text files that help you describe your venture in the best-possible light and predefined worksheets that you can fill in to create the necessary financial reports. Either program can save days of preparation time and ensure that you cover almost every topic of interest to a professional investor.

Choose *BizPlanBuilder*, a real handholder, if you're jumping into business for the first time. It all but writes the text of your business plan, and its manual is full of information and advice on marketing your product and approaching investors. *Business Plan Toolkit* provides less-structured guidance, which may be preferable if you're more experienced. It also boasts macro-generated graphs to include in your plan and more-thorough financial worksheets than *BizPlanBuilder*'s.



```
BIZPLAN.DOC  Attr: Normal     Pos: 49  Sect: 1                STRUCTURED EDIT
MANAGEMENT TEAM◂
XXX, President XXX Degree, University of XXX◂
XXX's professional experience Includes many different areas in the XXX
industry.◂
He/she has been involved in the XXX, and XXX's design experience covers many
diverse areas.◂
XXX required XXX's knowledge of XXX (example:  electronics and mechanical
design) to develop XXX (e.g., satellite tape recorders) that were used to XXX
(e.g., gather information from outer space).  At XXX (ABC Corp.), as a XXX
(design engineer), XXX was involved in the development of XXX (something
spectacular) -- for the first time.◂
After learning the basic techniques of XXX (example: COBOL Programming), XXX
worked with XXX (e.g., automated accounting systems).◂
While working for XXX, XXX was involved with XXX◂
F1:              F3:              F5:              F7:              F9:
F2:              F4:              F6:              F8:              F10:
```

BizPlanBuilder's text files (shown imported into *Lotus Manuscript*) constitute a fill-in-the-blanks business plan, complete with suggestions for filling the blanks. This screen shows text for describing your management staff.



Business Plan Toolkit includes 12 macro-generated financial graphs, including the financial-highlights graph shown above. The manual tells you where to place the graphs in your plan to achieve the greatest effect, but it relies on your word processor to integrate them.

Words and Numbers

A business plan comprises two major elements: a description of your company, your products, and the way you plan to sell them; and financial reports that project your company's performance over the next several years. Oddly, the description is often the most challenging to prepare. Despite an almost parental love for your product, it's often difficult to put its benefits into words.

BizPlanBuilder solves this problem for you with fill-in-the-blank boilerplate text files. It even offers some sample phrases you can use to fill in some of the blanks. For example, a section entitled Pay Back describes how your product pays for itself over time. *BizPlanBuilder* suggests the following text: "For most customers, *xxx* will pay for itself in terms of *xxx* within *xxx* months." To fill in the second blank, the manual suggests benefits such as "fewer rejects or breakdowns," "lower warranty costs," and "faster turnover of inventory." Of course, you're free to edit *BizPlanBuilder*'s text as you wish.

In contrast, *Business Plan Toolkit*'s text file contains only the headings of an outline for a business plan. To help you fill in the outline, the program's manual briefly describes the information required and asks evocative questions about your business. Some of these questions come from noted authorities on sales, marketing, and business development. For example, under the section entitled Sales Strategy, the manual poses questions recommended by the accounting firm Ernst

& Young. These include: "How will you identify prospective customers?" and "What is the sales productivity of each salesperson?"

When creating your plan's financial reports, your biggest challenge is to be comprehensive–to include everything a potential investor might want to see. Both programs attack this problem with a *1-2-3*–compatible template that automatically generates an income statement, a balance sheet, a cash flow statement, and a ratio analysis based on your budget and sales-forecast data.

Like its text file, *BizPlanBuilder*'s worksheet employs a fill-in-the-blank approach. For example, when preparing the sales forecast, you enter your first month's projected sales and either an annual-growth rate or a flat monthly increment. The program then generates the first year's sales data. To generate sales data for subsequent years, you again need only enter another annual-growth rate for those years.

Unfortunately, this automation exacts a toll: The formulas that generate these sales forecasts slow the worksheet's recalculation time. To work around this problem, the program uses manual recalculation as the default. That speeds up data entry, but it also means you must remember to press the CALC key whenever you edit data.

With *Business Plan Toolkit* you have to enter your sales-forecast data manually. However, the program offers other conveniences. For example, to prevent you from overwriting any formulas, the program's templates protect all cells except those into which you enter data. Macros let you move quickly from one area of the worksheet to another and print specific reports by pressing a single key. Automatic recalculation is faster than in *BizPlanBuilder* because the worksheet isn't burdened with data-generating formulas. And the balance sheet contains a handy "check line" that subtracts all credits from all debits. If the check line displays something other than zeros, you know at a glance that your balance sheet doesn't balance.

Business Plan Toolkit's most significant advantage is its set of 12 macro-generated *1-2-3* financial graphs. With a single keystroke you can get a picture of your sales forecast, a report on your cash flow, or your company's financial highlights, which would be an excellent illustration for your executive summary. Not only do these graphs add punch to your finished product, they also provide a quick, visual assessment of your business as you prepare or edit your financial statements. The manual provides tips on where to place these graphs in the text of your business plan, but the program doesn't integrate them–you have to rely on your word processor's ability to import graphics.

> BUSINESS PLAN TOOLKIT'S ADVANTAGE IS ITS SET OF 12 MACRO-GENERATED 1-2-3 FINANCIAL GRAPHS.

Business Savvy

Both programs calculate ratios that demonstrate your company's profitability and solvency, based on projected sales and debt. Although most potential investors will use your data to calculate proprietary ratios of their own, the ratios provided give a rough idea of how your business will perform over time and how you might stand with investors.

Business Plan Toolkit calculates 13 such ratios, *BizPlanBuilder* only 5, although instructions for calculating other ratios are included in the manual. Only *Business Plan Toolkit* calculates the acid test ratio: short-term debt divided by short-term assets other than inventory or accounts receivable. This calculation is considered the best measure of a business's ability to pay its monthly debts, a cogent topic these days among banks and other potential creditors.

Both programs' manuals include information and advice for budding entrepreneurs. *BizPlanBuilder* takes the more comprehensive approach. It includes a 126-page sales-and-marketing primer that covers basic marketing concepts, setting measurable business goals, consumer psychology, product distribution channels, and the various ways to incorporate. The manual not only defines concepts and strategies, but also provides questionnaires that help you choose the strategies best suited to you and your business goals. A recommended reading list is at the end of the section, followed by several sample layouts and font selections for the text portion of your plan. First-timers would do well to read the primer before using the program.

Perhaps the most useful part of the primer is the Sources of Capital section, which has information about getting money from banks, the U.S. Small Business Administration, venture capitalists, and private investors. The primer gives advice about each lender's motivation, how to present yourself as a good risk, and how to choose the lender and the financing arrangement that best suits your company.

Business Plan Toolkit teaches you while you use the product. For example, as you prepare the ratio-analysis section of your worksheet, the manual tells what these ratios signify and what banks and analysts consider to be favorable ratios. If you have some experience assembling business plans, you'll probably prefer this handy, concise information to *BizPlanBuilder*'s separate marketing section. ■

Jim Kinlan, formerly vice president of new-product development at Funk Software, is a consultant based in Massachusetts.

IN BRIEF

BizPlanBuilder Version 4.0. Jian Tools for Sales, 127 Second St., Los Altos, CA 94022, 800-442-7373. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers and Macintosh computers. Requires DOS 2.0 or higher, a word processor that reads ASCII files, and *1-2-3* Release 2.01 or higher or a compatible spreadsheet; Macintosh version requires *Microsoft Excel* or a compatible spreadsheet. Released 2/90. $99 30-day, money-back guarantee; 90-day warranty against disk defects.

Business Plan Toolkit Version 3.02. Palo Alto Software, 260 Sheridan Ave., Suite 219, Palo Alto, CA 94306, 800-229-7526. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers. Requires DOS 2.0, a word processor that reads ASCII files, and *1-2-3* Release 1A or 2.*x* or a compatible spreadsheet. A Macintosh version is also available. Released 1/90. $99.95 30-day, money-back guarantee; 90-day warranty against disk defects

How to Pick a Low-Cost Accounting Program

A consensus on the most important features and functions you can get for under $300

BY MARK SCAPICCHIO

REVIEW *of* REVIEWS

Don't look to computer magazines for help in choosing a low-cost accounting program. In the past year, the better known computer magazines published just two reviews of low-cost accounting software: "Economy Class Accounting" seen in *PC Magazine* (April 10, 1989) and "Affordable Accounting" in *InfoWorld*, (Sept. 11, 1989). Unfortunately, no program emerged as the winner.

PC Magazine picked *DacEasy* 4.03 ($149.95, DacEasy Inc., Dallas) as its favorite package and mentioned runners-up *Peachtree Complete III* ($199, Peachtree Software) and *Profitwise* ($229, Solomon Software, Findlay, Ohio). But the magazine withheld its coveted Editor's Choice award, claiming that "each product suffers from a significant handicap" that prevents it from winning the honor. *InfoWorld*'s review, which covers earlier versions of double-entry accounting programs, is outdated.

The one magazine that focuses on computers and accounting, aptly named *Computers In Accounting*, is no more conclusive. Its April/May issue reviewed 34 PC accounting programs, including 7 programs costing less than $299. But no program was singled out as the best in any price range. *Computers In Accounting* makes only general comments about the programs cited in *PC Magazine*'s review. It labels *DacEasy* "simple...an excellent choice for businesses who have basic accounting needs." It recommends *Peachtree Complete III* as "ideal for a small to mid-size company" because of its "sophisticated features." And it cites *Profitwise* as "a good choice for businesses with plans for expansion" because the program is easy to upgrade to Solomon's high-end *Solomon III General Accounting System*.

The reluctance of the magazines to pick a winner among accounting systems is understandable. To do so, a reviewer must pick the product that has the best chance of meeting everybody's needs. But each business has its own quirks and unique requirements for data entry, processing, and reporting. The program that has the best relative combination of features could grind lots of businesses to a standstill.

Given the magazines' reluctance to make strong recommendations, the burden of finding the best accounting system falls on your shoulders. You must sift through all the program features with cryptic names to find the accounting package that best meets your needs. One missing report or feature can drive you back to pencil and paper.

Help Yourself

There are ways to make this purchase easier. You can contact an expert--an accountant who regularly recommends systems for his or her clients. For more on finding and getting the most from such an expert, see the box at the end of this article.

MIKE REED

By all means read the reviews for program details. You can uncover a lot of valuable information by combing the text and feature tables. At best you may find the program you need; at worst you can narrow down the field before consulting an expert.

Try to determine if the program can automatically produce the reports you need. If not, find out if it includes a custom-report generator. Because there are numerous standard accounting reports, in most cases reviews discuss only notable omissions. For example, *PC Magazine* specifically states that neither *AccPac Bedford Integrated Accounting* version 3.3 ($249, Computer Associates International, Garden City, N.Y.) nor *Profitwise* print a 1099 report.

InfoWorld and *PC World* feature tables that tell you which programs generate user-defined balance sheets and income statements. *Computers In Accounting* also tells you which programs generate user-defined invoices and accounts receivable statements.

The ability to create custom reports is important if your company, industry, or bank has specific reporting requirements. Several of the products, including *AccPac Bedford* and *Peachtree Complete III*, offer little or no customized reporting in their base modules and require add-on packages ($129 and $99, respectively) to do the job. Only *PC Magazine*'s write-up specifically mentions *DacEasy*'s built-in report generator, which lets you "produce any report your business might need." It is also the only review that mentions whether the programs can export files directly to *1-2-3* (see the box on this page), where you can manipulate the data to create custom reports.

Find out if the program retains or purges account detail after you close out every month. For example, if you track an accounts receivable entry from last month, can you find out if the entry is a payment or an accrual? If your program purges detail every month, you won't have enough information to create a useful audit trail, and you may not have enough data to reconcile your accounts with your bank at year's end. Some programs purge the detail to a back-up file, which saves the data but creates extra work at the end of the year.

Neither *PC Magazine* nor *Computers In Accounting* covers this important issue. I found this omission especially troublesome after reading, in the outdated *InfoWorld* review, that *Peachtree Complete II* purges data at the end of the month. You need to know, rather than assume, whether or not *Peachtree Complete III* corrects this problem.

Will the program let you write and record checks from more than one bank account? The tables in the reviews indicate that *AccPac Bedford* and *One-Write Plus* version 2.01 ($299, Great American Software, Nashua, N.H.) allow for only one bank, whereas each of the others allows for at least nine. These two reviews also indicate which programs allow you to print custom checks.

Find out if the program's modules—General Ledger, Accounts Receivable and Payable, Inventory, and so on—are truly integrated, or if you have to rekey some data. *PC Magazine* describes many of the programs in its review as "fully integrated" but warns in its introduction that "not every module necessarily completely integrates with every other module." *Computers In Accounting* specifically mentions integration only once, in reference to a low-end program, commenting that "the most difficult part of *Act 1* ($199, Cougar Mountain Software, Boise, Idaho) to implement is the proper integration between the modules." However, both magazines thoroughly document which modules are included with each program.

Does the program have on-line help, and if so, how good is it? On-line help takes on special importance for a low-end accounting program. Most small-business environments are frenetic, so opening the manual is the last thing anybody wants to do. And most publishers charge for telephone support—up to $90 an hour.

Sometimes two magazines interpret the same fact quite differently. For example, *PC Magazine* tells us that the on-line help in *Act 1* does no more than direct you to the proper page in the manual. *Computers In Accounting* calls this same facility "helpful" because it "affords a quick method of finding information and seeing it in context." *PC Magazine*'s cynicism is preferable. All things being equal, you want the most complete, context-sensitive help you can buy.

Look for ease of use and features that save time. Are the program's menus easy to follow, and are there plenty of shortcut keys for repeated tasks? Can the program set up recurring journal entries? For example, can it automatically generate a rent payment or an invoice every month? Does the program provide a list of accounts to help you fill in fields? *PC Magazine* warns that *Act 1* allows line-by-line record editing only. That means you don't have the benefits of full-screen editing and must specify the record you want to edit rather than simply scroll to it.

Does the program protect your data from electronic mishaps? One that periodically writes data to your hard disk is preferable to one that waits until the end of a work session to save your changes.

SOLUTIONS TIED TO 1-2-3

Doing your accounting in *1-2-3* has its pluses and minuses. To its credit, *1-2-3* provides more flexible reports and customization than any low-end accounting program. To its detriment, it just can't provide the level of data security available in a dedicated accounting package.

If the pluses outweigh the minuses, look at *Ready-to-Run Accounting* ($199.95, or $299.95 with the financial-analysis module, Manusoft Corp., Culver City, Calif.), which was reviewed in our May 1989 issue. *Ready-to-Run* is a complete, integrated accounting system made up of macro-driven *1-2-3* worksheets. It's slower than a stand-alone program, but it saves you the time and trouble of transferring data to *1-2-3* for reports. It also provides complete audit trails. Perhaps most important, you can hire Manusoft to customize the program to your specifications—say, to automatically generate a custom report. No comparably priced accounting program advertises this service.

If you would rather use *1-2-3* strictly for reporting, look into *@Accounting* ($99, Great American Software, Nashua, N.H.), a data link between the manufacturer's *One-Write Plus* accounting program and *1-2-3* Release 2.2. From *@Accounting*'s menu you can select ready-made accounting reports in *1-2-3* format, based on the accounting data stored in *One-Write Plus*. Great American is also offering *Financial Manager*, a $795 bundle, which is made up of *1-2-3* Release 2.2, *One-Write Plus*, and *@Accounting*.

Of the low-end products mentioned in the *PC Magazine* and *InfoWorld* reviews, *Peachtree Complete III*, *Profitwise*, *AccPac Bedford*, *Quicken* ($59.95, Intuit, Menlo Park, Calif.), and *AccPac Easy* ($89, Computer Associates International, Garden City, N.Y.) can export data in *1-2-3*'s WK1 or WKS format. *DacEasy* and *Act 1*, however, cannot.

There is also a *1-2-3* template, *Guide to Small Business Accounting Software Priced Under $500* ($89, Computer Training Services, Rockville, Md.), that recommends one of 10 low-cost accounting packages based on your need for specific features. Programs covered include *AccPac Bedford, DacEasy, One-Write Plus, Peachtree Complete III,* and *Profitwise*, as well as *AccPac Easy*, *Money Matters* ($99, Great American Software), *Plains and Simple* ($395, Great Plains Software, Fargo, N.D.), *Point-of-Sale Plus* ($495, RealWorld, Concord, N.H.), and *Shoebox Accountant* ($195, CYMA-Worldwide Technology, Tempe, Ariz.). The 200-page manual that comes with *Guide to Small Business Accounting Software Priced Under $500* defines every accounting feature in terms of its usefulness to your business. —*M.S.*

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HOW TO GET THE MOST FROM A CONSULTANT

Need more help finding the right program? Before seeking advice, make a list of requirements based on your paper-based procedures. You may, for example, need purchase-order forms, invoices, or credit slips. Or maybe you use a cash register. You may run your business out of your own checking account, a separate account, or several accounts.

There's a myriad of questions to consider. How regular is your payroll? Which reports do you, your banks, your creditors, and your accountant want to see at the end of the month or the year? What inventory tracking and costing methods do you use? How do you reconcile accounts with the bank? What records do you retain for audits? And perhaps most important, who's going to use the system? What's their level of computer experience? How much help will they need getting started? After you've outlined your needs, talk to an expert.

—*M.S.*

Try to find out if the program can protect you from data-entry mistakes or from deliberate tampering. Sometimes providing one of these safeguards threatens the other. For example, *PC Magazine* insightfully points out that while *Peachtree Complete III* lets you adjust and correct an invoice amount (making it flexible enough to use as a point-of-sale system), it does not retain a record of that adjustment. The reviewer points out that the lack of a record "could cause problems if your sales clerks are giving preferential treatment to some customers without your approval."

If you need a password-protection scheme, pick the program that gives you the control you want. You may need to restrict access to key operations, for example, to those that add a vendor or change the chart of accounts. Or you may want control over which workers can read, edit, or add records. At the very least, pick a system that won't let you charge or pay a nonexistent account.

Need a High-End Program?

Find out if the program supports laser printing, and better yet, PostScript laser printing. Once a small business begins to thrive, a laser printer becomes a strategic advantage. Unfortunately, none of the reviews addresses the question of output.

Even a very small business may need more features than the low-end packages provide—particularly if more than one person needs to use your system at once. Mid-range and high-end accounting systems, ranging in price from $299 to $2,000 or more, offer advantages such as local area network support, more standard reports, and much tighter integration between modules.

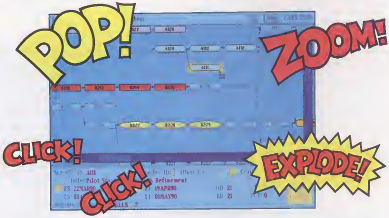
InfoWorld's review includes an excellent table that positions low-end, mid-range, and high-end accounting systems according to their applicability to small, medium, and large businesses. The programs are rated by their usefulness in a distribution, manufacturing, retail, or service setting. It's a shame that the table doesn't reveal the specific features that led to the ratings.

If you decide on a low-end program, *PC Magazine* encourages you to pick one with a well-defined upgrade path. High scores in this area go to *Profitwise*, which utilizes nearly the same interface as its high-end cousin, *Solomon III* ($795 per module), and to *Act 1*, which offers "a nearly seamless upgrade to *Act 2*'s multiuser, multimodule accounting...at a fire-sale price[$999.50]."

For information on high-end programs, read four reviews: *Software Digest Ratings Report* (January 1989, volume 6, number 1), *InfoWorld* (Feb. 27, 1989), *PC World* (July 1989), and *PC Magazine* (Sept. 26, 1989). Don't let the dates scare you. High-end products have much longer revision cycles, and few manufacturers have introduced upgrades over the time spanned by these reviews.

Mark Scapicchio is an associate product marketing manager for Lotus Selects.

Primavera introduces some important new project management terminology.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ZOOM!
CLICK!
CLICK!
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CIRCLE 114 ON READER SERVICE CARD

THE NORTON UTILITIES VERSION 5.0

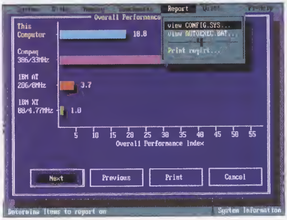
Takes a Giant Step Forward

Since 1983 only three things have remained certain in the PC business: MS-DOS, *Lotus 1-2-3*, and Peter Norton.

Norton came on the scene shortly after the first IBM PC and soon emerged as most every user's favorite guru. His first book, *Inside the IBM PC*, became the dog-eared manifesto of every corporate hacker this side of IBM. And *The Norton Utilities*, released in 1983, opened the inner chambers of MS-DOS to everyone with a copy of the book and a few hundred hours to kill.

Times have changed, and so have *The Norton Utilities*. Version 5.0 is proof that technical excellence and ease of use can improve year after year with no apparent end. This latest version is more accessible, more powerful, and more comprehensive than its predecessor (version 4.5) and all of its competitors.

Take the new File Fix program, one of about 20 utility programs included in this new version. Almost everyone has had a disk file ruined or transformed into garbage. The CHKDSK command in DOS restores the file to human-readable form and even copies it into a new, DOS-created file. But trash remains trash, and it's nearly impossible to use a "restored" file for anything but an excuse to go home early. File Fix, on the other hand, completely restores both the files and their data–even *1-2-3* worksheets can be restored to readable files.



The Norton Utilities **5.0** sports a new user interface and new programs.

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Another new program is Cache, a straightforward disk-caching program. The very useful Diskreet program lets you protect your files by creating a phony hard-disk drive that can be opened and closed only with a password. Those who don't have a password cannot access either the drive or the data it contains, even if they use *The Norton Utilities'* low-level snooping tools.

Calibrate is a testing program that can adjust disk interleaving and thereby improve access time and performance. A low-level reformatting program spruces up a disk surface to increase data retention and prevent future problems. This procedure leaves existing data unharmed, so you don't have to back up and restore your hard disk, as you do when you use the reformatting technique offered by most hard-disk vendors.

Those who worry about disk and file integrity will welcome the new File Save and Disk Monitor programs. File Save lets users specify how DOS should use erased file space. Normally, when you erase a file in DOS, it is not immediately removed from the disk. Rather, DOS marks the file's sectors as available for future use. File Save delays physical erasure of important files by referring to a user-defined priority list of the types of erased file space that DOS can use. Thus, you can erase files from the directory but keep them on the disk for as long as possible. DOS doesn't use their space until it has to. When you "undelete" an important file using Unerase, there's probably a good chance that it will be restored in its entirety. Incidentally, Unerase now searches for deleted files by file type (*1-2-3*, *dBase*, and text), by a text string, or by the former default method of erased file names.

Disk Monitor, a RAM-resident program, allows users to protect disks, files, and system areas from unauthorized disk writes. It informs users, via a pop-up window, of an application's attempt to write to disk and requests explicit approval to complete the disk write. This can be useful for those concerned about computer viruses, which typically write to system areas or to COMMAND.COM files. Another Disk Monitor option enables a "disk light," which appears on the screen whenever a disk is being accessed. This is a particularly good option for those who use remote network drives.

In addition to these new programs, all the programs included in previous versions of *The Norton Utilities* have been updated and expanded. All have a more accessible user interface. Those who use EGA or VGA displays and a mouse will probably agree that *The Norton Utilities* has one of the most responsive graphical user interfaces available in a non-*Windows* application. Those who do not use a mouse will be impressed with the range of options added to the programs via pull-down menus, dialog boxes, and radio buttons. And in most cases, reports produced by individual utilities can now be viewed on the screen, as well as printed or saved to disk.

The upgraded File Find program now searches for files by directory criteria such as date, time, size, and file attribute. Incorporated into File Find is the former Text Search program, which lets you find files that meet both external attribute criteria and internal data criteria. Also incorporated into File Find is the old Attribute program, which automatically assigns the read-only (or any other) attribute to files as they are found.

Safe Format, a fickle program at best in version 4.5, has been updated to do what it is supposed to do: format disks according to users' preferences, not its own. The previous version had particular problems with external laptop drives and with disks that contained system files. No more. Safe Format now does precisely what it is told to do. It still tells you what it thinks you should do with a particular disk, but it's much easier to override the program's choices.

The System Information program, once the paragon of benchmark testing, now does more thoroughly what its name implies. Not only have the speed tests been vastly improved and made more consistent with real-world operations, but the program also provides more-precise information about a computer's internal status. Everything from memory status to hardware interrupts to I/O ports to RAM-resident programs and device drivers are catalogued by this new update. In all, System Information provides about 20 screens of detailed analysis.

There is, of course, much more to *The Norton Utilities* version 5.0 than can be summarized here. But suffice it to say that this new version, though only a half integer upgrade from version 4.5, deserves a 10.0 for usability, power, and practicality. *—Garry Ray*

The Norton Utilities Version 5.0. Peter Norton Computing, 100 Wilshire Blvd., 9th Floor, Santa Monica, CA 90401-1104; 213-319-2000. Runs on the IBM PC XT, PC AT, PS/2, and compatible computers. Mouse-supported, network-compatible. Requires DOS 2.0 or higher and 512K of RAM. $199; introductory upgrades $49. Released 7/90

CIRCLE 1 ON READER SERVICE CARD

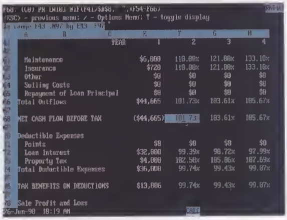
Instant Analyst

Helps Others Understand Your Worksheet's Logic

Like many cryptic modern novels, some worksheets tell a story only their authors can interpret. Personics Corp. of Maynard, Mass., offers *Instant Analyst*, a *1-2-3* add-in that quickly makes any spreadsheet comprehensible by highlighting percentages and ranges.

Instant Analyst is similar to Toast Development Corp.'s *Color Your Spreadsheet* (June, page 114). Both add-ins color ranges of numbers that meet user-specified criteria. But the comparison ends there. In *Instant Analyst*, this feature is a point of departure rather than an ultimate goal.

In *Color Your Spreadsheet*, you must specify criteria in absolute terms: "Color this range red if it's negative." But in *Instant Analyst*, you can specify criteria in relative terms: "Color range *x* yellow if it's two times greater than range *y*." Thus, spreadsheet anomalies are immediately apparent.



```
F68: (C0) PR @IF(F41>$D$8, "",+F54-F66)                                   READY
<ESC> - previous menu; / - Options Menu; ? - toggle display
  Range F43..N97 by E43  F97
     A           B          C           E         F          G          H
                                 YEAR         1         2          3          4


     Maintenance                           $6,000   110.00%    121.00%    133.10%
     Insurance                               $720   110.00%    121.00%    133.10%
     Other                                     $0        $0         $0         $0
     Selling Costs                             $0        $0         $0         $0
     Repayment of Loan Principal               $0        $0         $0         $0
 66 Total Outflows                        $44,665   101.73%    103.61%    105.67%

 68 NET CASH FLOW BEFORE TAX            ($44,665)   101.73%    103.61%    105.67%

    Deductible Expenses
     Points                                    $0        $0         $0         $0
     Loan Interest                        $32,000    99.39%     98.72%     97.99%
     Property Tax                          $4,000   102.50%    105.06%    107.69%
 74 Total Deductible Expenses             $36,000    99.74%     99.43%     99.07%

 76 TAX BENEFITS ON DEDUCTIONS            $13,006    99.74%     99.43%     99.07%

 78 Sale Profit and Loss
26-Jun-90  10:19 AM                          CALC
```

Instant Analyst places percentages over your *1-2-3* worksheet

Instant Analyst provides a menu-driven color-settings sheet that lets you enter up to eight color tests. The menu asks for the number of each test, the range to be colored, and the range or absolute value against which comparisons are to be made. You also specify comparison tests at this time. *Instant Analyst* provides a list of six criteria of the greater-than, less-than variety. After you choose a comparison factor to complete the formula, a final color menu lets you choose the color for cells that meet the criterion. Once definitions have been completed, *Instant Analyst* monitors the defined cells and updates their colors as necessary.

The second important feature of *Instant Analyst* is ratio analysis. In ratio analysis, you define a base range (say, quarterly sales) and *Instant Analyst* expresses related cells (say, quarterly expenses) as percentages of that range. This makes it easy to measure deviations from the base value. For example, using sales and expenses figures for four quarters, *Instant Analyst* can show each expense item as a percentage of sales and the variation of that percentage over four quarters. As a bonus, these percentages can be copied to another part of the spreadsheet or to a separate file.

Of course, you can do this manually by entering the appropriate formulas into a worksheet. But the *Instant Analyst* method is more sensible: The program simply overlays the "real" worksheet cells with its results, leaving the worksheet free of distracting material. In any case, *Instant Analyst* is easy to invoke and extremely easy to use. Its only shortcoming is that it removes the percentages from the screen when you change worksheet numbers, which means that you must continually flip in and out of ratio-analysis mode.

In sum, this is a fine utility for those who need to do on-screen analysis of a worksheet in progress. —*Garry Ray*

Instant Analyst Version 1.0. Personics Corp., 63 Great Road, Maynard, MA 01754; 508-897-1575. Requires *1-2-3* Release 2.*x*, 48K of RAM, and a color monitor. $69.95. Released 12/89.

CIRCLE 2 ON READER SERVICE CARD

1-Tute-3: Learn 1-2-3 While You Work

There are two traditional approaches to *1-2-3* training: the sink-or-swim school and the you-can-lead-a-horse-to-water-but-you-can't-make-it-think school.

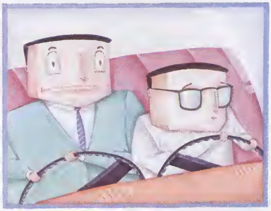
The first is endorsed by the dozens (maybe hundreds) of *1-2-3* reference manuals, guidebooks, and videotapes that are thrown at the student. In trying to grasp them, the student may sink under their weight.

The second school uses semifictional case studies and courseware to provide an example of what the student might encounter when booted rudely into the real world.

What the student needs is a bridge between courseware and actually using *1-2-3* in real work situations. *1-Tute-3 Tutorial Toolkit* (and *SymphonEase Tutorial Toolkit*, for *Symphony*), from PC-philes Inc. of Hollywood, Calif., fills that gap in training materials.

1-Tute-3 is a *1-2-3* add-in that provides its own tutorial language for building training "scripts" (PC-philes calls this the proprietary tutorial language) and an interpreter that runs those scripts against real worksheets in the bona fide *1-2-3* environment. *1-Tute-3* is akin to the second steering wheel in cars used in driving schools: The environment is real, but there are some controls against disasters.

Developing *1-Tute-3* scripts, which are actually programs, requires some programming skills, but certainly no more than are needed to use the *1-2-3* or *Symphony* command languages. In fact, there are only 30 or so commands, most of which control the display of explanatory messages to the user of the tutorial. Also included are commands that nest one script file within another, commands that require student input, and a few commands that control the tutorial environment—PATH, for example, to indicate the directory that contains the script files and practice worksheets.



For the tutorial developer, the greatest benefit of *1-Tute-3* is that it automatically handles such mundane tasks as placing display panels and explanatory text on the screen. In addition, the add-in automatically assigns four navigation keys for use during the tutorial and determines precisely how to move the student through the tutorial. In other words, *1-Tute-3* does most of the drudgery so that developers can concentrate on the content of the tutorial, not on the mechanics of implementing it.

The other benefit of *1-Tute-3* is that it uses real-world *1-2-3* worksheets, not simulations. Thus, you can teach students to work with custom templates, to build their own worksheets, or even to use add-in applications purchased by your company. However, some worksheets might need to be tailored for use under *1-Tute-3*; a worksheet that takes 10 minutes to recalculate under *1-2-3* will require the same time under *1-Tute-3*. That's probably not good training methodology, unless you're trying to subject trainees to the agony of a lengthy recalculation.

Aside from those problems, which can be solved by careful design of a *1-Tute-3* tutorial, there are others that can be solved only by a new version of the program. First, there's no built-in text editor like those provided in, for example, Borland International and Microsoft Corp. programming products. Developers who use *1-Tute-3* must create, edit, test, and debug their scripts by leaving *1-2-3*, starting a text editor, saving the tutorial, restarting *1-2-3*, and so on. This process can be quite annoying.

Second, the debugging facility is rudimentary and shows only the source line that is currently being executed; it would be better if it had a window that showed more of the source code. Overall, the product is a weak development tool. The needs of tutorial coders should be given more attention in the next version.

These flaws, however, are outweighed by the consideration given to the problems and requirements of *1-2-3* trainers. By dispensing with simulations, *1-Tute-3* provides an elegant solution to teaching *1-2-3* in a real environment. —*Garry Ray*

1-Tute-3 Tutorial Toolkit and *SymphonEase Tutorial Toolkit*. PC-philes Inc., 7510 Sunset Blvd., Hollywood, CA 90046; 213-850-5622. Both products released 5/90. $350.

CIRCLE 3 ON READER SERVICE CARD

JOHN URSINO

BUSINESS, FINANCE

Real-Time 3-D Modeling

Analyst One is a three-dimensional modeling tool that combines real-time calculations with historical analysis of financial data. The software allows users to build a financial database by entering data directly or by importing *1-2-3* PRN files. Data can also be exported into text files for use in *1-2-3* or a word-processing program. The product includes a report generator, a word processor, and graphics and security options.

Runs on the IBM PC and compatible computers. Requires DOS 3.0 or higher, 512K of RAM, and a hard disk $199, from Feldstar Software, P.O. Box 871564, Dallas, TX 75287, 214-407-1006.

CIRCLE 4 ON READER SERVICE CARD

UTILITIES

DOS Utility Manages Memory

Memory Master version 1.1 maximizes the use of DOS conventional memory in several ways. Several swap utilities let you load and run many terminate-and-stay-resident programs–including *SideKick* and *SideKick Plus, PC Tools Deluxe* 5.5 and above, *Tornado, MemoryMate, Norton On-Line Programmers' Guides,* and *Lotus Metro/Lotus Express*–in less than 8K by swapping to and from expanded memory, extended memory, or a hard disk. The EDOS utility can liberate 96K of RAM on systems that contain at least 256K EGA or VGA video cards; a utility called EEMRAM does the same for systems with an EEMS or hardware-capable LIM-EMS 4.0 expanded-memory board. Rollout lets you toggle between large applications, and Pmap shows how all your computer's memory is being used.

Requires DOS 2.0 or higher. $69.95, from Vericomp, P.O. Box 23360, San Diego, CA 92123; 800-876-0400, outside the U.S. 619-277-0400.

CIRCLE 5 ON READER SERVICE CARD

OTHER SOFTWARE

Computerized Stock Quotes and Clipping Service

FNN NewsReal is a "personal news manager" that automatically searches the Dow Jones News/Retrieval database for news and quotes. You can customize the program to search for particular information, including a company name. To locate the information, *FNN NewsReal* can access the Dow Jones News Service (the "Broadtape") or examine on-line stories from *The Wall Street Journal* or *Barron's.* You can also request delayed quotations of stocks and mutual and money-market funds. You can order up to four automatic searches a day. The program also simplifies access to the more than 55 business and financial databases available on Dow Jones News/Retrieval.

Runs on the IBM PC and compatible computers. Requires 640K of RAM, DOS 2.1 or higher, a hard disk, and a Hayes-compatible modem. $179, includes five hours of time on Dow Jones News/Retrieval; additional connection time is charged at normal rates. From FNN Data Broadcasting Corp., 1900 S. Norfolk St., San Mateo, CA 94403; 800-433-7068.

CIRCLE 6 ON READER SERVICE CARD

Manage Release 2.x Expanded Memory Better

Beyond 640 is a memory-management add-in for *1-2-3* Release 2.*x*. Release 2.*x* normally handles expanded memory by linking each active worksheet cell to a pointer in conventional memory. *Beyond 640* improves upon *1-2-3*'s native memory management by storing the entire worksheet, including worksheet pointers, in expanded memory. This provides up to 4 megabytes of worksheet space in expanded memory.

Requires Release 2.*x* and LIM-EMS 3.2 or 4.0 expanded memory. $95 plus $5 shipping, from Intex Solutions, 161 Highland Ave., Needham, MA 02194, 617-449-6222.

CIRCLE 7 ON READER SERVICE CARD

Draw and Edit Graphics with WordPerfect

AccuDraw is a drawing program that allows you to create and edit graphics images that are compatible with *WordPerfect* WPG files. These files can be directly incorporated into *WordPerfect* documents without additional conversion. *AccuDraw* comes with more than 300 predrawn images, though users can access the program's drawing functions to produce custom graphics.

Runs on the IBM PC and compatible computers. Requires graphics display, 512K of RAM, DOS 2.0 or higher, a mouse, and *WordPerfect* 5.0 or 5.1. $95 plus $3 shipping, from Athena Technologies, 160 E Main St., P.O. Box 1261, Westborough, MA 01581; 800-525-3577.

CIRCLE 8 ON READER SERVICE CARD

Print 1-2-3 Data on Company Forms

FormType 3.0 is a forms-processing program that has interfaces to *1-2-3*, *dBase*, and other software. The interfaces let you incorporate data from other applications directly into specialized invoices, checks, timesheets, and any other form that a company uses. *FormType* includes a memory-resident form-printing program that captures and reformats data from the source application as it is being printed. *FormType* then prints the data according to its form-definition specifications.

Runs on the IBM PC and compatible computers. Requires DOS 2.1 or higher or OS/2, a floppy-disk drive, a hard disk, 512K of RAM, and a printer. $149.95 ($229.95 after 9/3) for the single-user version; $695 for the network version; $69.95 ($99.95 after 9/3) for the run-time version (no form-creation tools included). From Easy Automation Systems, 5555 Triangle Pkwy., Suite 440, Norcross, GA 30092; 404-840-0474

CIRCLE 9 ON READER SERVICE CARD

UPGRADES

IBM Current version 1.1 is IBM's upgrade of its personal-information manager. Like version 1.0, it includes calendars, Gantt charts, address books, an outliner, and a letter writer. But the new version also includes Dynamic Data Exchange capabilities for use with other *Microsoft Windows* 3.0 applications, enlarged database capacities, improved cut-and-paste facilities, and improved data-directory and font support.

The new version ships with a run-time version of *Windows* 2.1 and runs with *Windows* 2.*x* and 3.0. Requires an IBM-compatible 80286 or 80386 computer, DOS 3.3 or higher, 640K of RAM, a hard disk, and an EGA or VGA adapter $395; upgrade free to registered *Current* users by calling 203-783-6006 From IBM Desktop Software, 472 Wheelers Farm Rd., Milford, CT 06460; 203-783-7000

CIRCLE 10 ON READER SERVICE CARD

HyperAccess/5 version 1.1 communications software has been upgraded to include virus-filtering technology. The program now monitors file transfers from other computer systems to detect more than 60 software viruses, warning the user of a virus before file transfer has been completed. The program uses the same set of virus patterns as IBM's *Virus Scanning Program* to monitor file transfer.

Runs on the IBM PC and compatible computers. Requires DOS 2.0 or higher, OS/2 1.0 or higher, and at least 350K of RAM. $12.95 for upgrade from *HyperAccess/5*, $49 for upgrade from *HyperAccess*, $199 for DOS and OS/2 versions. From Hilgraeve Inc., Genesis Center, 111 Conant Ave., Suite A, Monroe, MI 48161; 800-826-2760.

CIRCLE 11 ON READER SERVICE CARD

DBMS/Copy 2.0 will translate files to and from all ASCII formats and 65 software applications. Among the applications are popular spreadsheets (including *1-2-3*), databases, statistical programs, and graphics packages. It reads and writes each application's native format without the use of intermediate files. Additional features include a new pop-up menu system and a macro recorder. An enhanced version, *DBMS/Copy Plus*, adds a programming language that lets you select variables, filter records, and perform computations during conversion. An economy version, *DBMS/Copy Lite*, has no programming features and translates only among spreadsheets, databases, and ASCII formats.

Requires DOS 2.1 or higher, 384K of RAM, and a hard disk. $195 (*Plus* version, $295; *Lite* version, $89), from Conceptual Software, P.O. Box 56627, Houston, TX 77256-6627; 800-782-8969.

CIRCLE 12 ON READER SERVICE CARD

PrintAPlot 2.0 turns a printer into a plotter. The memory-resident utility translates HPGL (Hewlett-Packard Graphics Language) pen-plotter commands so that graphics images can be printed on most laser, ink-jet, and dot-matrix printers. New features in release 2.0 include the ability to print large drawings on multiple pages, scale drawings from 1% to 500% of their original size, and position a drawing on a page using either or both axes.

Requires DOS 3.0 or higher, 256K of RAM, and a supported printer. $299; users of version 1.0 may upgrade for $100. From Insight Development Corp., 2200 Powell St., Suite 500, Emeryville, CA 94608; 800-825-4115, in Calif. 415-652-4115.

CIRCLE 13 ON READER SERVICE CARD

Version 2.0 of *Graph*, a graphics package for scientific plotting and data transformation, now offers grid-line plotting, histograms, logit and probit axes and transforms, the ability to reverse the plotting direction of the axes, and goodness-of-fit statistics for its least-squares fitting capacity.

Requires DOS 3.1 or higher, 640K of RAM, and a graphics card. $149 (upgrades, $29), from MicroMath Scientific Software, P.O. Box 21550, Salt Lake City, UT 84121; 800-942-6284, in Utah 801-943-0290.

CIRCLE 14 ON READER SERVICE CARD

HARDWARE

A Faster Graphics Card for VGA Displays

The Hercules Graphics Station Card is a VGA-compatible graphics card that the manufacturer claims is up to five times faster than the competition. The card's speed is boosted by the combination of a Texas Instruments TMS34010 graphics coprocessor and 1 megabyte of accessible memory. Maximum resolution of the board is 1024 × 768 pixels with 256 colors.

Requires an IBM-compatible 80286 or 80386 computer and a VGA monitor. $1024, from Hercules Computer Technology, 921 Parker St., Berkeley, CA 94710; 415-540-6000.

CIRCLE 15 ON READER SERVICE CARD

Record Computer Presentations on Videotape

The Vision VGA video graphics card lets you record both standard and high-resolution VGA text and graphics on videotape. It allows a VGA monitor to operate in noninterlaced mode while recording, and it incorporates an anti-flicker filter that reduces image flicker on interlaced monitors. The card can output standard VGA, RGB component, Sync, S-VHS, and NTSC or PAL video at the same time.

Requires an 80286-based computer or better, DOS 3.0 or higher, and 512K of RAM. $795 with 256K of memory or $895 with 512K, from Vision Technologies, 48431 Milmont Dr., Fremont, CA 94538; 415-683-2900.

CIRCLE 16 ON READER SERVICE CARD

TRAINING

Audio/Disk Training for 1-2-3

How to Use Lotus 1-2-3: Releases 2.01 and 2.2 and *Advanced Training for Lotus 1-2-3 Release 2.2* each consist of four audiocassettes, a data disk, and a quick-reference guide. The first course covers the essentials of designing and navigating worksheets, creating databases and graphs, writing macros, and using formulas, @functions, and ranges. It also covers printing with *Allways*. The *Advanced Training* course emphasizes creating advanced macros but also covers linking and combining files and using date, string, and financial functions.

Courses require an audiocassette player. $119 each, from FlipTrack Learning Systems, 999 Main St., Suite 200, Glen Ellyn, IL 60137; 800-222-FLIP, outside the U.S. 708-790-1117.

CIRCLE 17 ON READER SERVICE CARD

BOOKS

The Software Encyclopedia 1990, by R.R. Bowker. Lists 21,192 microcomputer programs. Listings include version number, description, number of disks, authors, release date, compatible hardware, memory required, and other statistics. Cross-referenced under 612 individual categories. 2,522 pages (2 volumes), $189.95 (paperback). Published March 1990 by R.R. Bowker Co., P.O. Box 762, New York, NY 10011; 800-521-8110; in New York, Alaska, or Hawaii 272-337-6934 collect.

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The Other Side of Software: A User's Guide to Defining Software Requirements, 2nd Edition, by Carolyn Shamlin. Tells executives and managers how to conduct a computer-system analysis, develop software specifications, plan for expansion, and control end results. 204 pages, $22.95 (paperback). Published February by Amacom Books, a division of American Management Association, 135 West 50th St., New York, NY 10020; 518-891-1500.

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Opportunity Lost

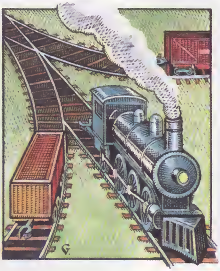
BY CHRISTOPHER O'MALLEY

Sometimes the big news to come from a series of events is what *didn't* happen. Such was the case with the "font wars" waged recently by some of the industry's biggest guns.

What started out as the rather uninteresting process of deciding on a suitable font system for OS/2's Presentation Manager quickly became the catalyst for strategic alliances among the likes of IBM, Apple Computer, Microsoft Corp., Adobe Systems, and Hewlett-Packard Co. But these alliances not only failed to yield a single, unchallenged font standard for OS/2, they effectively squandered a far greater opportunity–the chance to make it easy to display, print, and transfer documents between computers of any type or size.

For those of you who have misplaced your scorecard, the font battle lines have been drawn as follows: IBM decided earlier this year to use Adobe's PostScript fonts and font-rendering technology as the standard for all of its computers–from PCs to mainframes. A few months before, Microsoft and Apple had agreed on a technology called Royal (now known as TrueType) that will be incorporated into the next release of OS/2, *Windows*, and Apple's System 7.0 operating system. TrueType is also expected to be used in a PostScript-compatible printer language called TrueImage, which Apple and possibly others plan to use in future laser printers.

Strangely enough, these arrangements pit OS/2 partners IBM and Microsoft against one another and make foes of former PostScript partners Apple and Adobe. But wait–it gets worse. Hewlett-Packard, whose LaserJet printers dominate the laser-printer market, is going its own way with a technology called Intellifont, a system developed by typography leader Agfa Compugraphic.



The result, of course, is *no* clear direction for the future of fonts. Now the talk has turned to an "open font standard," which is techno-doublespeak for: "We didn't sit down and work this thing out, so we'll agree to disagree and support different font technologies as best we can." In other words, the very state of confusion we were hoping to avoid in the first place.

Admittedly, there may be little reason for concern in the short run. Most DOS and *Windows* applications will continue to expand their support for screen and printer fonts, while OS/2 remains well within the realm of the experimental for most of us. And as all of the feuding fontsters are quick to point out, every program or printer that works today will continue to work just fine as the various font strategies are deployed.

But this complacency diverts our attention from the bigger picture and the importance of what these corporate alliances do–and fail to do–for the future of computing. What's at stake is great: the way we'll create documents, how they'll appear on paper, and who we'll be able to share them with.

Had the powers-that-be agreed upon a single standard for displaying and printing fonts, we'd find ourselves in the dawn of a new era in which documents are effortlessly passed from PC to Mac to mini to mainframe with all of their special formats and niceties intact, ready to be accurately displayed or printed at any step along the way. Instead, we find ourselves facing more of the same: needless barriers across computing platforms.

This is not just a word-processing or a desktop-publishing issue. The documents in question also include database reports, presentation graphics, and yes, spreadsheet models. (Remember how irrelevant the appearance of spreadsheets seemed until products like *Allways* and *Excel* came along?)

What's really frustrating is that we were so tantalizingly close to achieving that new era. Microsoft and Apple, both of whom were miffed at Adobe's stiff licensing fees and strict control of PostScript, no sooner struck a deal than Adobe said it would go public with PostScript. At the same time, IBM was telling anyone who'd listen that it had to protect its customers' interests in PostScript, a pledge it kept by choosing Adobe technology as the font standard for its Systems Application Architecture (SAA). HP, meanwhile, was readying its new LaserJet III with an optional PostScript cartridge, as well as Intellifont.

Is there anyone who doesn't believe that IBM, Microsoft, Apple, and HP could collectively have hastened Adobe's change of heart and agreed to pursue a public domain PostScript rather than separate paths? We will all suffer the effects of these companies' failure to look beyond their quarterly earnings reports. ■

Christopher O'Malley is a free-lance writer based in Delray Beach, Fla. and a frequent contributor to *LOTUS*.

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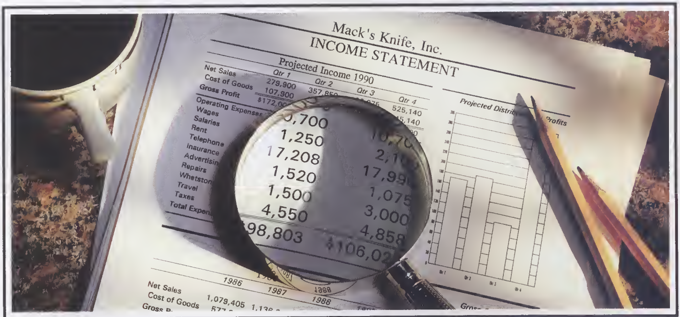

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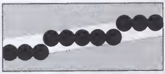

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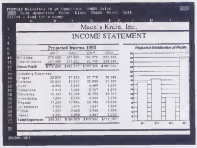

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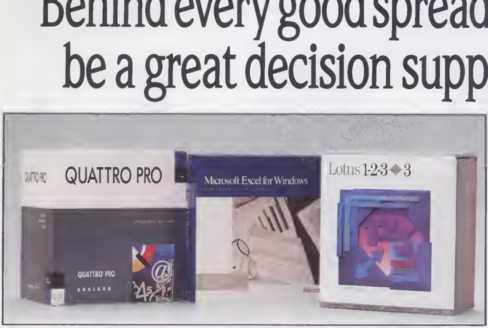

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